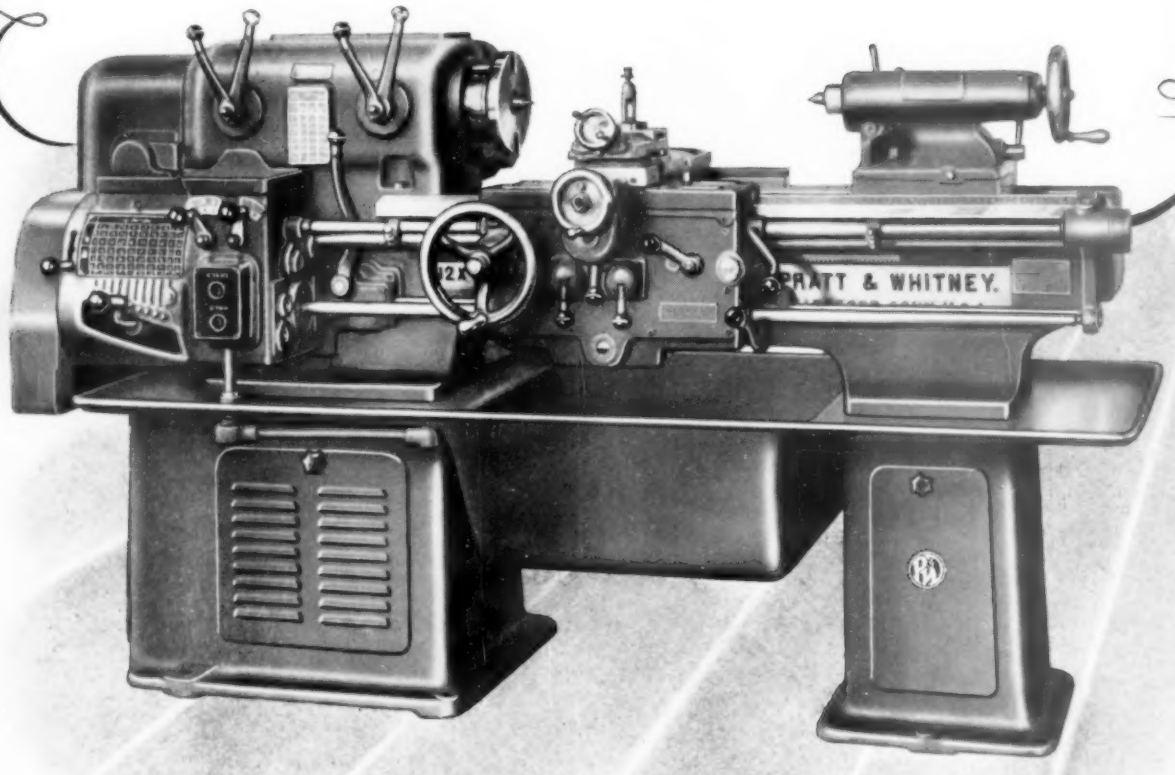
THE TOOL ENGINEER

OFFICIAL PUBLICATION: AMERICAN SOCIETY OF TOOL ENGINEERS

Behind every manufactured product is the tool engineer

Built to maintain **P&W** *precision*



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Pratt & Whitney

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WEST HARTFORD 1, CONNECTICUT

Model "C" LATHE

The Tool Engineer

Official Publication: American Society of Tool Engineers

June, 1949

Vol. XXII, No. 6

Editorial

The Experience of Others

WE ARE ALL aware of the great changes that have been wrought in the American way of living by the adoption of a system of manufacture based on the interchangeability of parts.

Equally important, but not so widely appreciated as another phenomenon of our industrial life, is the interchangeability of ideas.

The uninformed public believes that no manufacturer would reveal his methods and processes except under duress. Nothing could be farther from the truth.

Undoubtedly, the automotive field presents the outstanding example of what can be done with a free exchange of information within a very important and normally highly competitive industry. The results have been spectacular.

In less than fifty years the impact of the development of this one industry has been felt throughout our whole economy.

The automobile is a highly complex, high quality machine, yet it sells at a price low enough that there are 33,000,000 passenger cars in use in the United States.

It is safe to say that today's automotive achievement would still be decades away had it not been for the free exchange of essential manufacturing data.

Of course, no one would be so naive, in a land of competitive enterprise, as to deny that there are jealously guarded trade secrets. On the other side of the picture, however, industry as a whole is anxious to exchange information on all phases of manufacture common to their own operations and those of other manufacturers.

The voluntary professional societies, such as our own, and the trade associations are the principal forums for the exchange of such ideas and information, although many organizations, corporations, and individuals play important roles.

Establishment of standards and the promotion of their adoption by industry is one of the means employed. Dissemination of technical data through media such as our own ASTE Data Sheets is another. Organizations such as The American Standards Association have contributed heavily by gathering material from many sources and by bringing together all the diverse parties at interest to ensure that the results will be accepted as standard throughout the field of manufacture.

The sponsoring of research into common problems, often in conjunction with leading educational institutions, and the publication of the findings in the Society Journals and in papers presented before Society meetings and conventions is another important aspect of the cooperative employment of joint experience.

The trade press, too, certainly deserves a top credit rating for promoting exchange of information. Their articles, describing the latest in equipment and practices, have contributed importantly to this movement. Everyone can profit by the experience of others.

Next month, we as a Society will be making our greatest single contribution when the Tool Engineers' Handbook becomes a volume of reality. Within those blue and gold embossed covers will be the time and accumulated knowledge and experience of hundreds of men, companies, and industries, unselfishly given that all may profit.

R. B. Douglas

President 1948-49

THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second class matter, November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscription, $2.00. Non-members, $6.00. Canada, $6.50; all other foreign countries, $8.00 per year.
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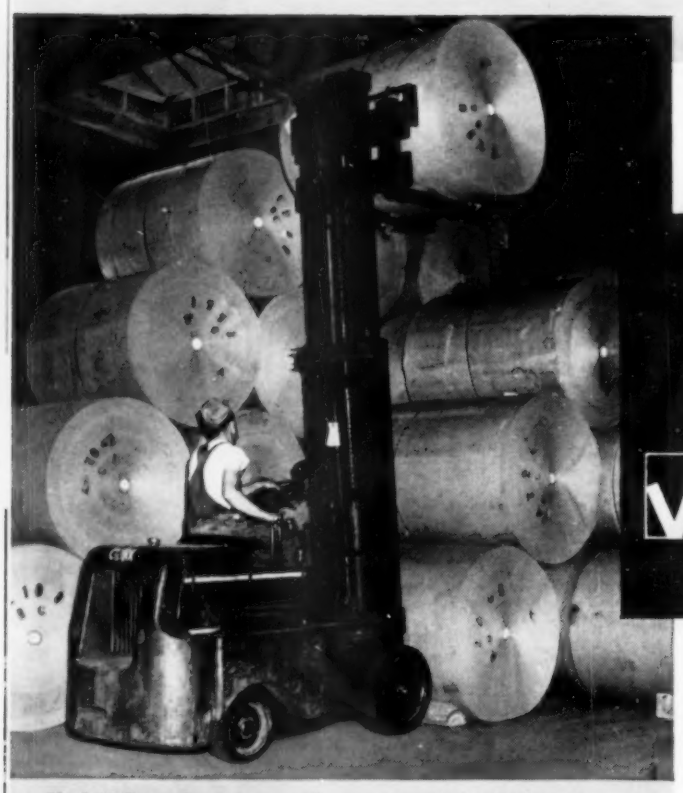
CLARK ELECTRIC and GAS POWERED FORK TRUCKS



Clark Utilitruc (gas-powered) saves time in tiering heavy rolls of paper fiber board.

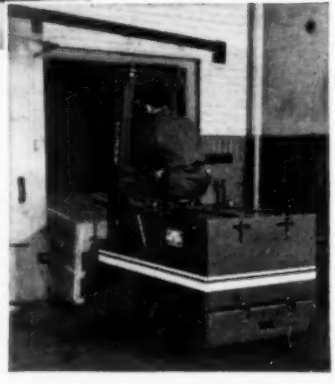
more Cost-Cutting applications of VICKERS HYDRAULICS

The Industrial Truck Division of the Clark Equipment Company uses Vickers Vane Type Pumps on all of its electric battery-powered models and some gas-powered models to provide hydraulic power for lifting and tilting. Many models also have Vickers Multiple Unit Valves for control of this hydraulic power. Only a few of the many types and sizes of Clark Trucks so equipped are illustrated here. Vickers Hydraulics is an important factor in the cost-cutting ability demonstrated by Clark Fork Lift Trucks on a wide variety of materials handling operations.

Vickers Balanced Vane Pumps are notable for their efficient operation and long life. Their exclusive hydraulic balance construction prolongs pump life by entirely eliminating pressure-induced bearing loads and resulting wear. Write for Bulletins 49-52 and 36-12.

Vickers Sectional Type Multiple-Unit Valves are available in many combinations for operating single- or double-acting cylinders. They provide convenient and selective control and include relief valve for overload protection. Write for Bulletin 40-13.

Clark Elec-Utilitruc reduces the cost of handling locomotive parts in railroad shop yards.



Clark Elec-Carloader with Hi-Lo-Stack device passes easily through a 7 ft high door opening, yet it will tier to 130 inches with ease.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Preventing END BEARING OF GEAR TEETH...

- increases their factor of safety
- reduces gear noise
- and prolongs service life

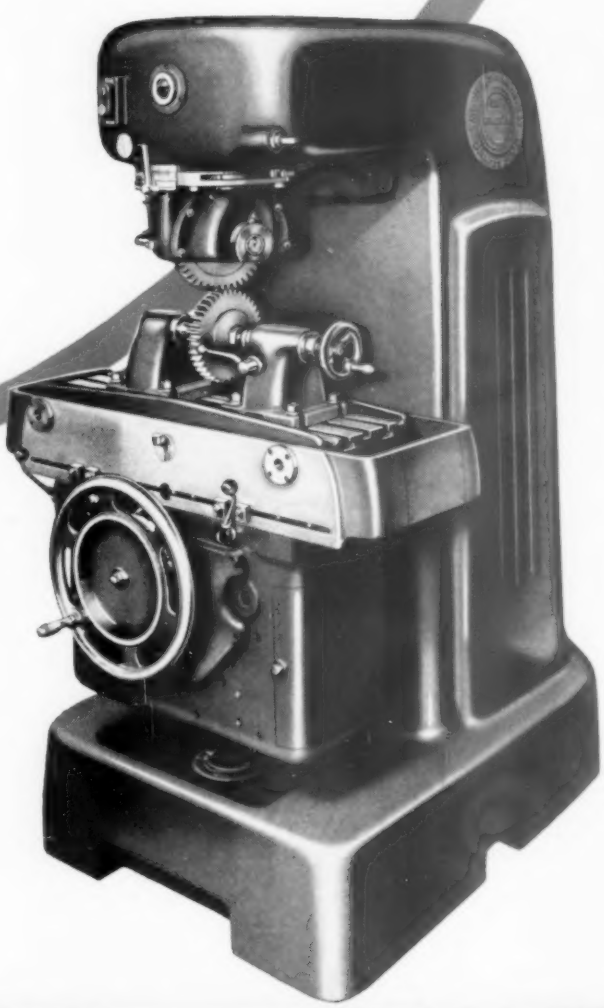
Conventional gear teeth (spur or helical) can be expected to behave as they should theoretically only on the drafting board. When they are made of steel and assembled in a power unit, it is a rare accident when bearing is uniform across the entire faces of any two mating teeth. In nearly every case bearing is concentrated at one end of the tooth or the other where it is most vulnerable to failure.

The remedy is the Elliptoid Tooth Form, engineered and produced by Red Ring engineers 12 years ago. The Elliptoid Tooth Form positively prevents end bearing as demonstrated by actual experience in hundreds of applications.

One nationally known manufacturer of trucks and tractors received frequent complaints of gear tooth failures until he adopted the Elliptoid Tooth Form. Since then such complaints have practically vanished. Elliptoid transmission gears tested by this manufacturer for 125 hours under a load of 140 foot pounds and then for an additional 125 hours at 180 foot pounds showed no harmful effects.

Another top ranking tractor manufacturer says the service life of his Elliptoid gears is 30 times greater than that of previous conventional gears. Elliptoid gears are produced on Red Ring Gear Shaving Machines.

Send for descriptive literature.



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AND ELLIPTOID TOOTH FORM

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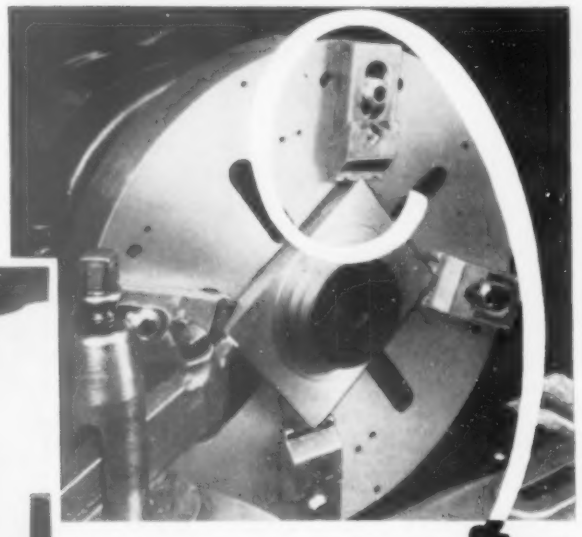
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

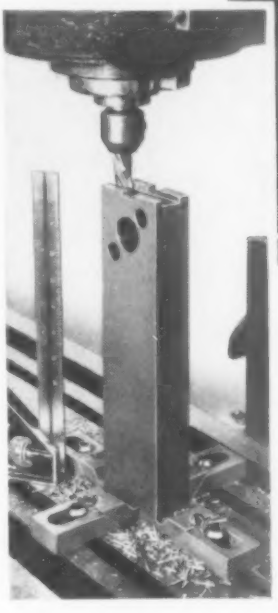
These NEW SIDE-GRIPPING, SELF-LOCKING JAW CLAMPS can save time and money IN YOUR SHOP

J & S Jaw Clamps* hold all sizes and shapes of work-pieces tightly against face plates of lathes, planers and other machine tools. Clamp is self-locking to table and can not slip back. Also used for holding non-ferrous metals rigidly in grinding machines.

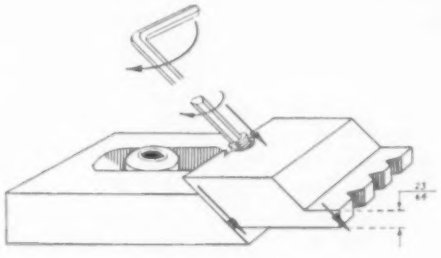
The full surface of work 3/8" high or over, may be machined without interference from the clamps, as the latter grip the work-piece on the sides and the jaws are only 23/64" thick. Since the overall thickness of the clamps is only 15/16" they do not usually protrude above the level of the work-piece and, cannot interfere with the reading of the indicator dial of vertical boring and milling machines.

J & S Jaw Clamps facilitate controlled centering adjustment on the clamped work-piece. Secondary operations are unnecessary. They eliminate different length studs and blockings. There are no separate parts to get lost. Only one adjusting screw. Tested for two tons down pressure.





● Upper photo shows J & S Jaw Clamps holding flat work-piece to face plate of lathe. Note close-up view showing side-gripping action. Photo to left shows how tall work-piece with small base can be held rigidly enough to permit heavy milling operation.



As indicated in the drawing, the direction of travel of the movable jaw of the J & S Jaw Clamp is in a direction of 45° with the plane of the face plate. Turning the screw to the right causes the jaw to move in a direction that forces the work-piece horizontally toward the opposite jaw clamp and downward against the table or face plate. If special profile is required for the holding face of the jaw, quotation will be furnished on request.

"T" nuts for J & S Jaw Clamps are furnished in dimensions to fit standard "T" slots in face plates. Please advise size of slots for which "T" nuts are required.

The J & S All-Purpose Jaw Clamp is sold in sets of four clamps, including standard socket wrenches, hardened "T" slot nuts, 1/2-13 special bolts and hardened washers.

PRICE, F.O.B. East Orange, N. J.

(per set of four) **$29.75**

Extra nuts, each . . $.50 Extra bolts, each . . $.20

Extra washers, each . . . . $.05

TELEPHONE: ORange 5-4022

*Pat. Pend.

J & S TOOL COMPANY, INC.
491 Main St., East Orange, N. J.

Also Manufacturers of Fluidmation and Form-Master Wheel Dressers, and Special Form Grinding to Customers' Specifications

J & S TOOL COMPANY, INC.
491 Main Street
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Please send us one set of J & S Jaw Clamps with "T" slot nuts to fit a ..... " slot. We will try these in our shop for five days and reserve the right to return them post paid if not satisfied. Otherwise, you may invoice us for these Jaw Clamps in the usual way.

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City ..... Zone ..... State .....

Ordered by .....

Signature .....

A *TEN* STRIKE

The Norton CERAMIC Surface Plate

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1. **Extremely long life** is assured for these wear-resistant plates which are made of one of the hardest substances known.

2. **Flat within .0001"** is the guarantee for these ceramic surface plates—an important quality in precision measuring.

3. **Permanent flatness** is a feature of these ceramic surface plates that will not warp or deform, give expansion troubles or deflect under load.

4. **Smooth surface** allows easy movement of instruments and work across plate without drag or vibration but with correct "pull" for accurate measuring by operator.

5. **Non-magnetic** nature of this ceramic surface plate permits work to be removed from magnetic chuck and checked without necessity of demagnetizing.

6. **Non-corrosiveness** is another feature of Norton ceramic surface plates which are impervious to any atmospheric condition and do not require protection from moisture.

7. **Ideal for blueing** is the special surface texture of these plates. A uniform film is readily transferred from the plate to the work.

8. **Faster, more accurate** readings are possible because of the precise flatness and extreme smoothness of these ceramic surface plates.

9. **Prevents wear** of expensive instrument bases, gage blocks and sine bars because of the flat, smooth surface of these ceramic surface plates.

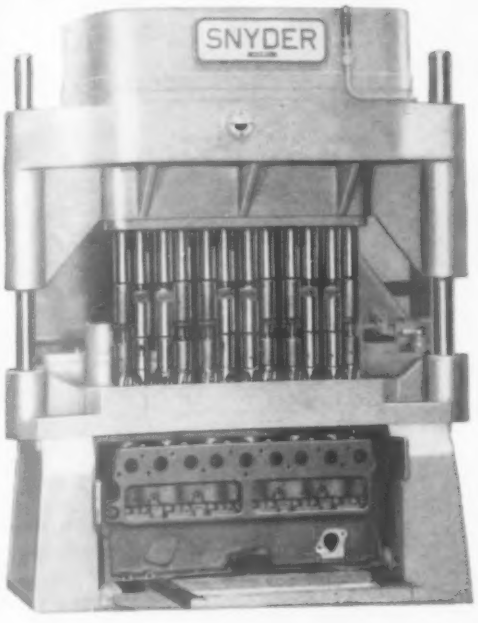
10. **Easily cleaned** with any soap powder and water—and periodic cleaning is recommended.

Write for Free Bulletin No. 1174

NORTON®

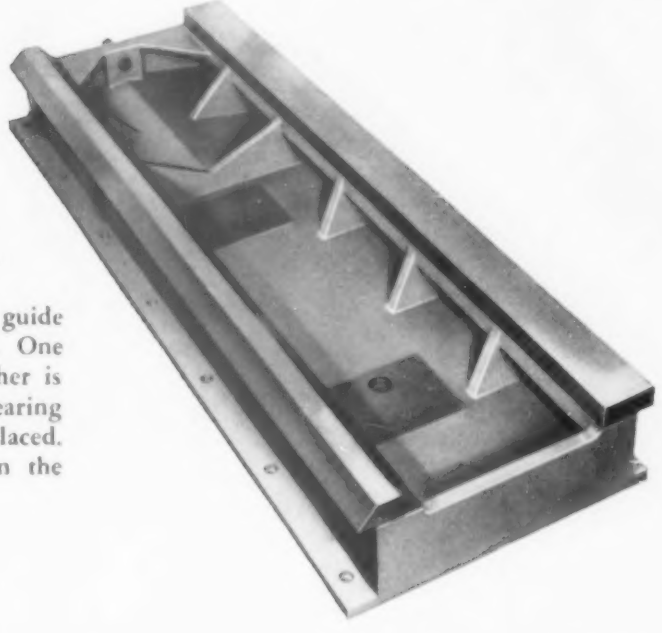
CERAMIC SURFACE PLATES

SNYDER *Machines Cost Less in the Long Run*



SNYDER MACHINES USE THEIR HEADS TO SAVE MONEY

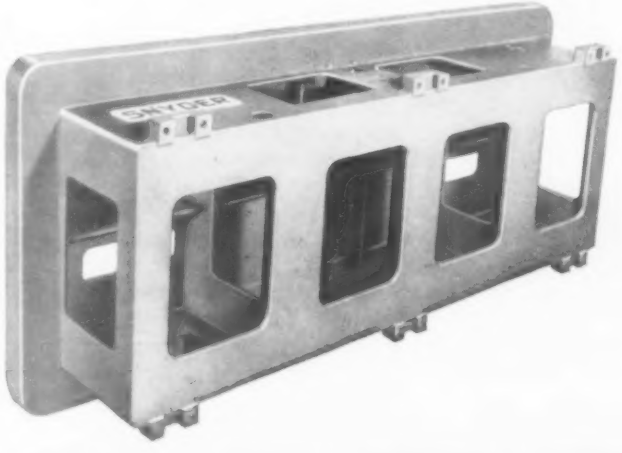
A good machine can use its head to save you money. On Snyder heads, for example, spindles, idlers, drivers and pump drive gears are mounted in ball bearings with circulating lubrication. Every time a shaft or gear turns, money is being saved for you. Most heads are built with pick-off gears to cut down time in making speed adjustments. Multiply these savings over a span of 20 years and it is obvious that Snyder craftsmanship costs less in the long run.



HARD WAYS TO MAKE MONEY FOR YOU

A Snyder feed unit may travel as much as 25,000 miles in the course of a machine's lifetime, so what it travels *on* is important.

We mount feed units on hardened and ground ways or guide bars – hardened for wear, ground for super-smoothness. One of the ways is V-type to keep accurate alignment, the other is flat. They are anchored from the bottom—no holes on the bearing surface to catch grit. They are easily and inexpensively replaced. This top notch craftsmanship costs just a little more in the beginning but saves you plenty in the long run.



SAFE ON BASE—IF IT'S A SNYDER

You might be surprised at how much attention we give to "tailoring" the base so that it properly supports the machine members—and blends with the design. We use welded steel or cast iron, heavily ribbed, normalized and sand blasted and equipped with properly located leveling screws and hold-down blocks. We lavish attention on the humble base because it is the backbone of every machine and therefore the number one rigidity factor. A good one will always save you money in the long run.

SNYDER

TOOL AND ENGINEERING COMPANY

3400 E. LAFAYETTE
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24 Years of Successful Cooperation with Leading American Industries

Remove up to 6 cu. ft. of Cast Iron Per Tool Grind on Modern Planers

Strong, Durable, Clamped-on Kennametal Planer Tools . . . Make Heavy-Duty Planing Practicable

Now you can take heavy roughing cuts at high speeds (100-250 ft/min) on any of the newer type planers having a tool lifter. Clamped-on Kennametal Planer Tools make it practicable . . . and *profitable*. They remove metal at a faster rate—keep machine down time to a minimum—reduce tooling cost per piece—minimize grinding time and confusion.

Yes—you need a good, rigid, properly-powered, correctly-adjusted planer. And you *must* have a strong, shock-proof, thermal-strain-free carbide tool that can take a beating and like it. Here's where the uniformly sound structure of mechanically-held Kennametal K1 pays off. Read these typical performance reports:

"Kennametal Planer Tools remove 6.5 cubic feet of semi-steel per tool grind." "5 cubic feet of 180 Brinell cast iron removed per grind." "6 cubic feet of 180 Brinell cast iron removed per grind."

Our field engineers can help you apply this cost-cutting Kennametal tooling to your planing operations. Ask them to do it. And keep in mind—the cemented carbide that has the strength and durability to do tough roughing jobs on planers successfully is the carbide that can cut tooling costs on *all* your milling, boring machine, and lathe work. That's Kennametal.

KENNAMETAL *Inc.*, Latrobe, Pa.®

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTION

Here's what they tell us
ABOUT THIS NEW DRILL:

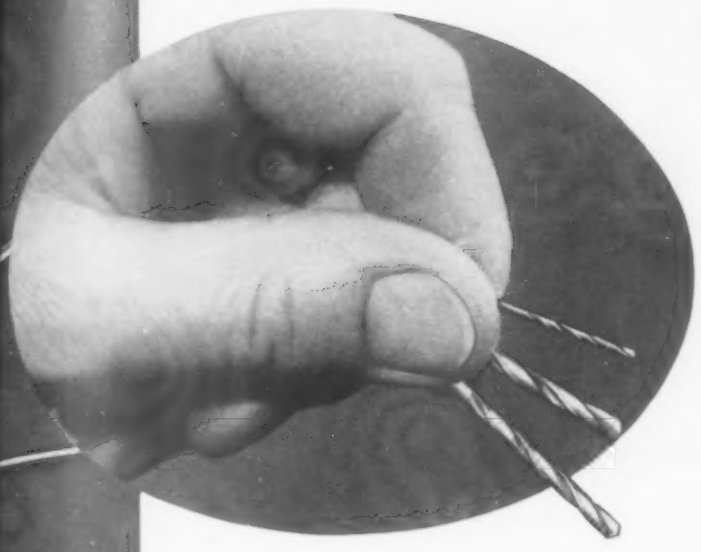
"... we estimate it has drilled a total of 6682", or *3100 times its length!*"

"... after about 75 hours, the drill was reground, put back in the machine, *and is still running!*"

"... 133,850 pieces in No. 8620 Steel with 1 dozen G-Style Drills!"

...the "AMBORE" DRILL

that gives 50% More Production



HERE IT IS! Here's the *new* Morse Drill ... with its new thousand-dollar name ... ... the "AMBORE" ... *the drill of fewest changeovers.*

Here is the first really big news in drills since Stephen Morse produced the first twist drill. This new drill is *ground from the solid* ... with heavier web, constant angle, and wider flutes that clear chips in a faster, easier flow. And then, finally, it's processed by a *New Morse Method* that gives this drill more strength, toughness, and flexibility than any other drill now made...to withstand the higher speeds of today's production demands.

Proved by exhaustive field tests, this new Morse Drill is available to you... *now* ...in 59 sizes from No. 80-30 to $\frac{1}{64}$-$\frac{1}{8}$"...from your own Morse-Franchised Distributor. Call him *today* on *your* problem.

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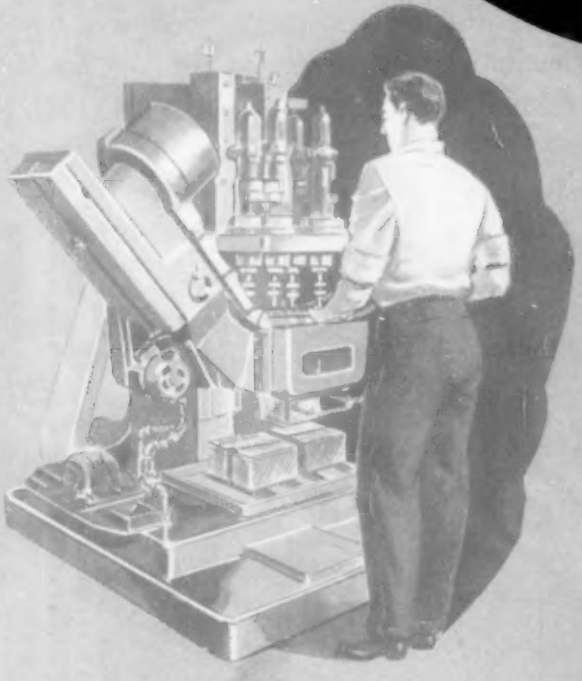
WINTER

TAPS IN ACTION



ALWAYS AT YOUR SERVICE

YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER STRAIGHT SHANK TAPPER TAPS are recommended for fast, clean, high quantity production in nut tapping machines. They are furnished with plain round shanks at regular prices, and are also available with squared end, Acme Type "C", or National Interchangeable Ring Lock shanks at additional cost. In carbon steel, they are stocked in fractional sizes from ¼" diameter to 1½" diameter, and in machine screw sizes from Screw Gauge No. 4 to No. 12—all with cut thread only. In high speed steel, they are stocked in fractional sizes only, from ¼" diameter to 1" diameter, with choice of cut thread or commercial ground thread. Winter also manufactures bent shank tapper taps, and a complete line of other taps, including hand, chip driver, machine screw, nut, pipe, pulley, and stove bolt taps, as well as a full selection of dies.

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company
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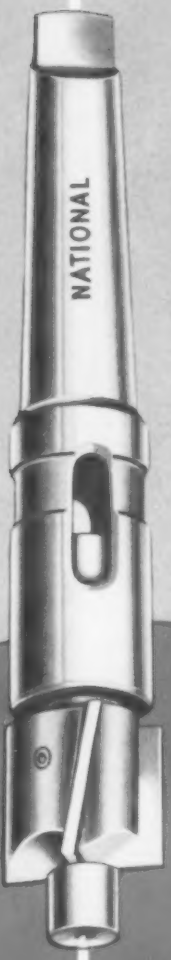
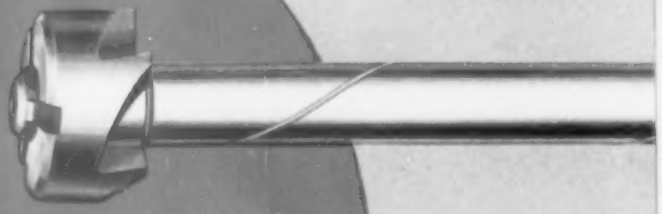
NATIONAL METAL CUTTING TOOLS

ON THE JOB



NATIONAL INTERCHANGEABLE COUNTERBORES are rugged, efficient, and adaptable. The simplicity of design of the spline-taper drive is one of its best recommendations. Taper shank and socket for alignment and rigidity; spline keys for jam-proof and twist-proof performance—that is all there is to it. Equal ruggedness, positive driving, and accurate alignment are obtained in the spline drive of **NATIONAL INVERTED SPOTFACERS.** Pilots fit snugly in the cutter; driving is accomplished through splines that are part of the pilot, bearing against slots in the cutter. The cutter is retained by solid shoulders on the pilot, yet removal is easy. National also makes solid counterbores, and a full line of standard and special rotary metal cutting tools, including twist drills, reamers, milling cutters, end mills, hobs, and special tools.



NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

National

CALL YOUR DISTRIBUTOR

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL metal cutting tools. Call them for cutting tools or any other staple industrial product.

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Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

CUT HEAVY *and* LIGHT STOCK *Both*

NIAGARA

You don't have to adjust knife clearance on Niagara Power Squaring Shears every time you cut a different thickness of stock! Niagara capacity ratings are maximum capacity ratings, and they cut any thickness of stock up to their top rating WITHOUT TINKERING WITH THE KNIFE ADJUSTMENT.

And to prove it, look at the photograph at right...one man is cutting a 20 gage sheet and the other is cutting 5/8" plate BOTH AT THE SAME TIME, AND WITH THE SAME KNIFE ADJUSTMENT, AND WITH THE SAME GOOD RESULTS.

This is done daily in our own plant on our own work. We gladly demonstrate.

It speaks for Niagara design, Niagara rigidity, Niagara strength and the recognized ability of Niagara shears to deliver more working strokes per hour.

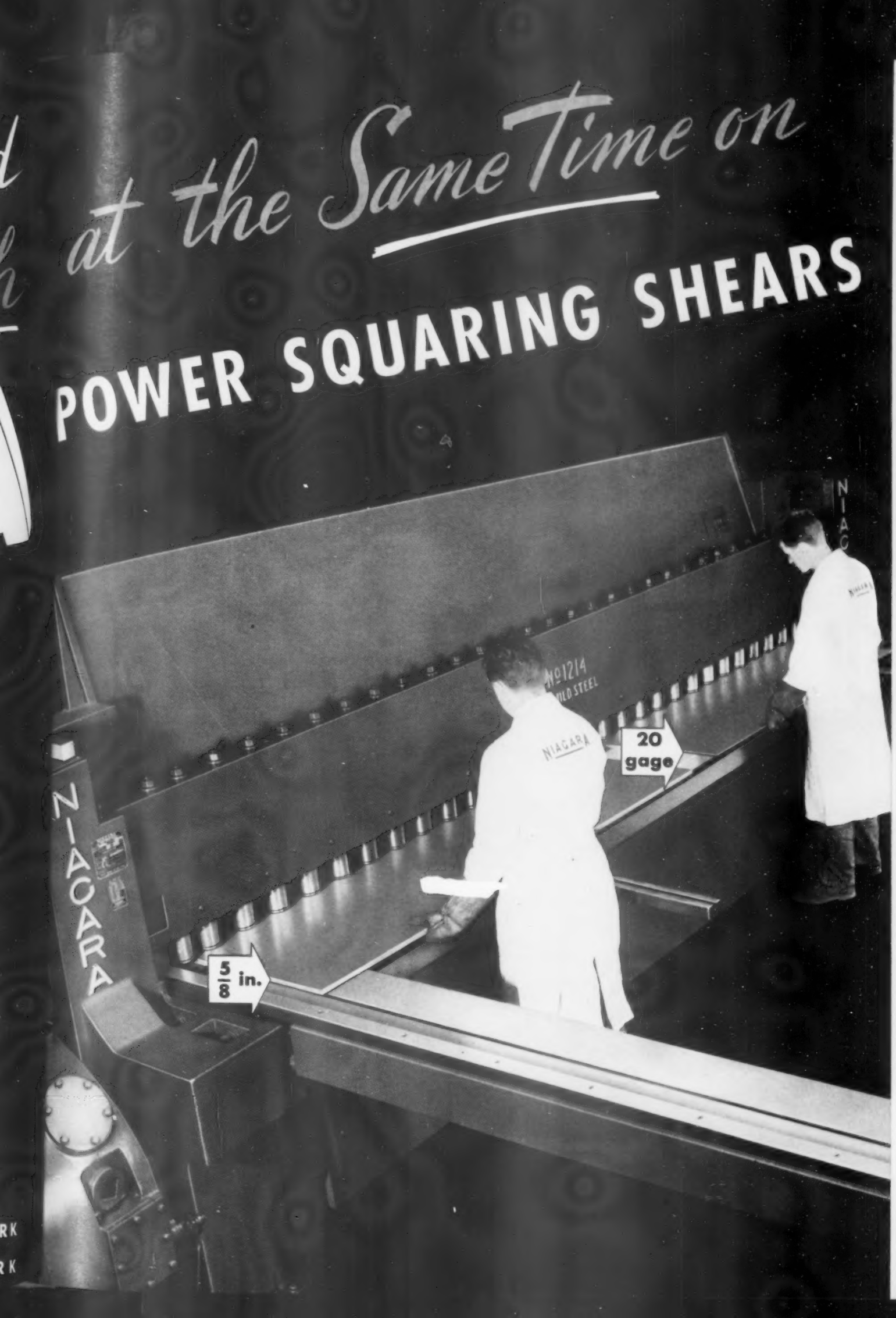
Write for bulletin.

NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, NEW YORK

DISTRICT OFFICES: DETROIT, CLEVELAND, NEW YORK

at the Same Time on

POWER SQUARING SHEARS



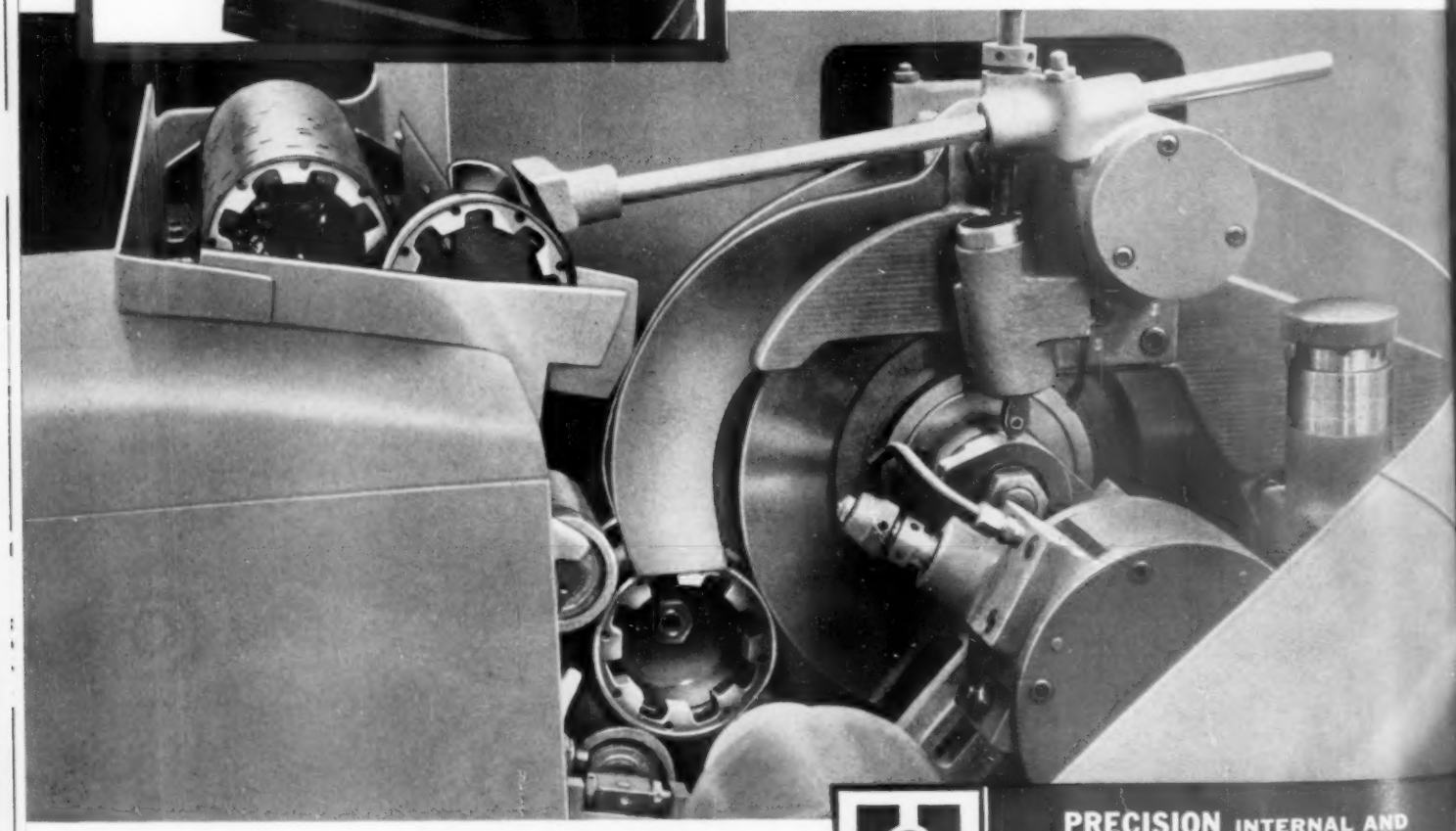
PRODUCTION OF TRANSMISSION CAMS SHIFTS INTO HIGH!

These transmission cams are precision ground on the fully automatic Model 281 Centerless shown below. All the operator has to do is keep the loading chute filled and remove the finished parts from the unloading chute.

Automotive manufacturer increases production 75% with New Heald Centerless Internals

Two Heald Model 281 Centerless Internals are now precision finishing transmission cams 75 percent faster than was possible by previous methods. The cams are of two different types —both ground on the I.D. on one machine. One type, however, has a counterbore on one side, which is ground on the I.D. and face simultaneously on the other Heald Centerless —by means of a backing plate which keeps the work in contact with the face of the wheel until the proper depth has been reached.

If you have work that can be rotated on its own O.D., why not see how much time and money you can save by doing it on a Heald Centerless Internal? Your nearest Heald representative will be glad to help you.



THE HEALD MACHINE COMPANY
Worcester 6, Mass.

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HEALD

PRECISION INTERNAL AND SURFACE GRINDERS

PRECISION BORE-MATIC FINISHING MACHINES

Milling Cutter Design and Operation

Part One of a Two-Part Section

By Mario Martellotti
DEVELOPMENT ENGINEER
THE CINCINNATI MILLING MACHINE COMPANY

THE PRODUCTION capacity of milling equipment and the economy of a milling operation depend largely on the design, type, use and maintenance of the milling cutter selected for the operation.

Satisfactory cutter performance from the viewpoint of rate of stock removal, life between resharpenings, quality of finish of the machined surface and the required dimensional accuracy in the operation are of particular importance, especially when the milling equipment is used in the production of parts in large quantities.

Delays which may be caused by faulty grinding or poor selection of the elements of the cutter, such as the cutting angles, number of teeth and cutting material, may add up to a lower production rate than expected and a substantial increase in the cost per piece.

Types of Milling Cutters

As a general rule, standard type or commercially available milling cutters are used whenever possible because of lower cost and availability from stock. But they may not be as efficient as cutters of special design, which are fitted to the particular requirement of the milling operation.

Standard milling cutters are designed for general application in a variety of jobs, and, although they may be found sufficiently satisfactory in some cases, in others they must be either modified or replaced with a special cutter made to fit the operating conditions.

Special Milling Cutters

Special cutters should be designed with a viewpoint of holding first cost and maintenance costs to a minimum without impairing performance and durability. Consideration should be given to the number of teeth, the chip space between consecutive teeth, the tooth shape, the tooth angles, the cutter diameter and the cutting material of which the cutter is to be made.

In many operations the adoption of special milling cutters brings about important economies by combining cuts and simplifying cutter design.

An example of an inserted tooth special face milling cutter for milling aluminum and magnesium alloys at high rate of metal removal and high quality of finish of the milled surface is shown in Fig. 1.

One blade takes the roughing cut; the other blade projects 0.010 in. farther and performs the finishing cut. An excellent surface finish results from this combination, eliminating variations that would be produced if the cutter were made with a large number of teeth.

In this instance, the radial rake angle is 20 deg. negative, to direct the chips toward the periphery of the cutter, while the axial rake angle is 20 deg positive. However, larger angles can be used in cutters designed to operate on light alloys exclusively, provided that the parts to be milled are rigidly supported and the sections of the workpiece have a sufficient thickness to prevent vibration.

With "Milling Cutter Design and Operation," The Tool Engineer presents the first section of a comprehensive series of articles on modern milling practice. Other subjects coming in future issues will include product design for maximum machining results; production milling; fixture design; and the economics of milling.

A somewhat different design of special two-tooth sintered carbide tipped end mill, also for milling light alloys, is shown in Fig. 2. The radial rake angle is obtained by off-setting the ground face of the teeth with respect to the centerline drawn in the plane of the cutter parallel to the teeth faces. The axial rake angle is obtained by grinding a flat surface of the blade shank to produce the desired angle when the

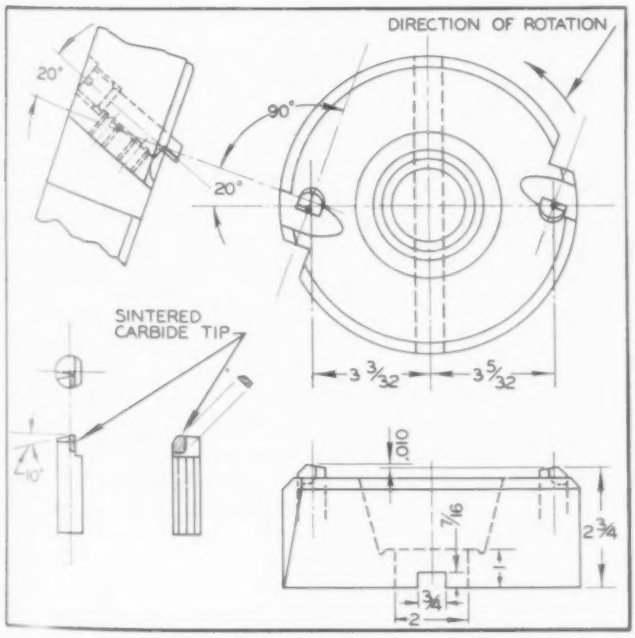

Fig. 1. Special two-tooth sintered carbide tipped face milling cutter for light alloys.

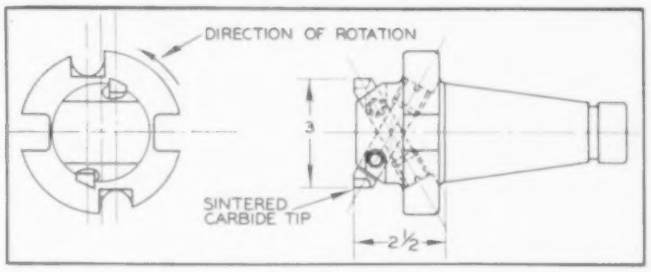

Fig. 2. Special two-tooth end mill designed for milling magnesium alloys with sintered carbide cutting material.

blade is clamped in the body. The same or similar cutter design can be used for milling aluminum or steel with high speed steel cutting material by selecting the proper tooth angles.

A special face mill for milling alloy steels with sintered carbide material is the one shown in Fig. 3.

An interesting feature of this design is the use of standard square shank lathe tools tipped with sintered carbide material inserted in corresponding holes in the cutter body; and the self-contained clamps. These consist of two bushings, one of which is tapped for the threaded end of the clamping screw. The bringing together of the two bushings clamps the tools firmly in position. Either bushing can be replaced when worn out by usage. Thus, this eliminates the difficulty which would result if the threads were located in the cutter body.

The shanks are parallel to the axis of the cutter, and the 6 deg positive axial rake angle is obtained by grinding the carbide tip. The radial rake angle of 10 deg negative is obtained by grinding the tip to an equal to the difference between the 14 deg setting angle and the desired 10 deg negative angle. Each tooth is resharpened individually by removing it from the body of the cutter.

In the design of special milling cutters, it is possible to make a more appropriate selection of: the number of teeth, the cutting material, the design of the tooth shape and chip space, between consecutive teeth, the tooth cutting angles and the cutter diameter.

Number of Teeth

For good cutter performance strong tooth section, ample chip space between teeth, economy in cost and maintenance, good cutting efficiency, and a continuous cutting action, as a general rule:

A milling cutter should be provided with a number of teeth so that not more than two teeth are engaged in the cut at any time.

On this basis, in *face milling cutters*, if D is the cutter

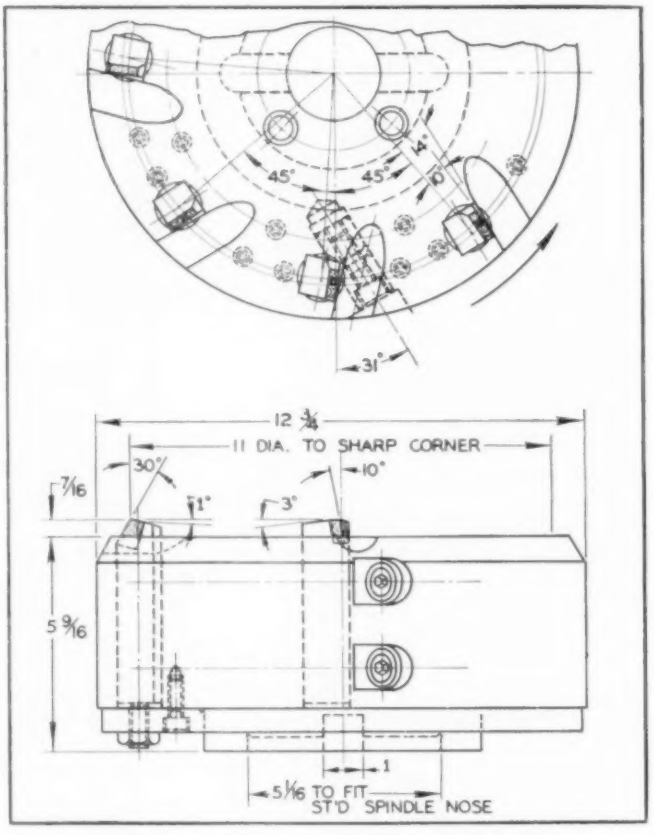

Fig. 3. Milling cutter with positive axial and negative radial rake angles designed for face milling alloy steels.

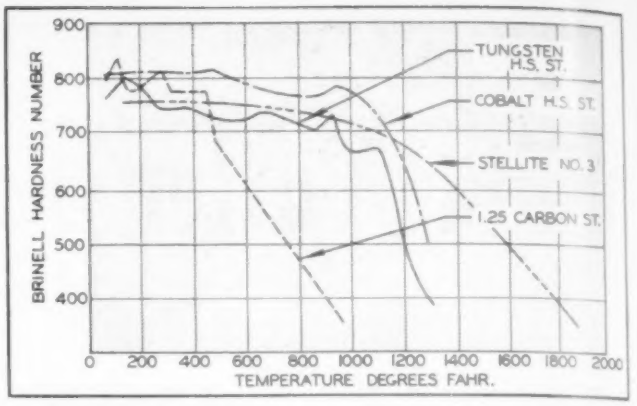

Fig. 4. Hardness of typical cutting tool materials as affected by temperature.

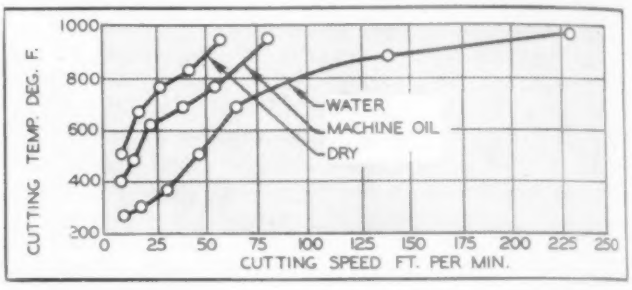

Fig. 5. Cutting temperature as affected by the cutting speed and the type of cutting fluid used in turning a mild steel bar with cast non-ferrous tool material.

diameter, in.; W is the width of cut, in.: then the number of teeth is:

$$T = \frac{2\pi D}{W}$$

For example, if $D = 6$ in. and $W = 4$ in., T is approximately equal to 10.

In the case of *peripheral milling cutters*, such as a slab mill, where d is the depth of cut, in.; a is the helix angle of the teeth in degrees; and D is the diameter of the cutter:

$$T = \frac{4\pi D}{D + 4d}$$

For $D = 4$ in., $a = 45$ deg and $d = 1/4$ in.

$T = 8$ teeth, but if $a = 25$ deg, T, $= 10$ teeth approximately.

For a combination of teeth in contact other than two, formulas 1 and 2 should be divided by two and the result multiplied by the desired number of teeth in contact.

At no time should the number of teeth in a milling cutter exceed that number which will permit full utilization of the power available in the machine. This is especially the case when using cutters tipped with sintered carbide. To prevent overloading the driving motor, the number of teeth should not exceed the value calculated from the following formula:

$$T = \frac{K\ Hp}{F_t\ N\ d\ W}$$

where:

T = number of teeth in the cutter.
K = Constant, which may be taken equal to 0.65 for average steel; 1.5 for cast iron and 2.5 for aluminum. (These are conservative values which take into consideration the dulling of the cutter in service)
Hp = Horsepower available at the cutter.
F_t = Feed per tooth, inches.
N = Revolutions per minute of cutter.
d = Depth of cut, inches.
W = Width of cut, inches.

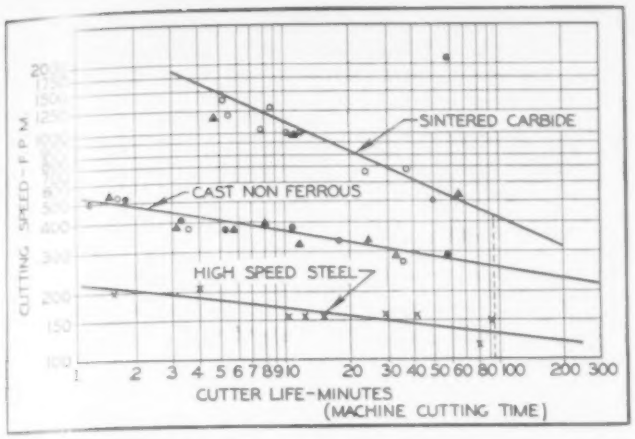

Fig. 6. Cutter life in minutes as affected by the cutting speed of a face mill tipped with different cutting materials when milling cast iron.

Cutting Materials

The metal cutting materials used in milling are (1) the tool steels, particularly high speed steels of various compositions (2) the cast non-ferrous, and (3) the sintered carbides.

These materials must be *stronger* and *harder* than the material to be cut and sufficiently *tough* to resist shock loads resulting from the cutting operation. They must also have good resistance to abrasion, permit a keen cutting edge, provide reasonable tool life and retain a high degree of hardness at the temperature developed during cutting, a quality known as *red-* or *hot-hardness*.

The cutting tool materials available possess these qualities in varying degree. Some of these materials, for example, have high hardness, moderate strength and toughness, and good wear resistance. Others have high strength, moderate toughness, high resistance to wear and high red-hardness.

The variation in hardness with temperature of cutting of typical cutting materials is shown in Fig. 4.

The red-hardness of sintered carbide surpasses that of any other cutter material. At 1,300 deg F sintered carbide still retains a hardness of between 83.5 to 84.5 Rockwell A, which corresponds to 64 to 66 Rockwell C, the hardness of high speed steel at room temperature. For this reason, sintered carbide cutters can be run from 3 to 10 times as fast as high speed steel cutters.

The selection of the cutting material to use in any one application will depend on its properties, and the performance record obtained either through tests or actual use. For any given tool angles, cutting material, and material being cut, the temperature at the tool point depends largely on the cutting speed (Fig. 5).

The softening of the cutting tool material resulting from the temperature of cutting affects the tool life.

The cutting speed has a determining influence on the cutting temperature (Fig. 5) and, consequently, on the life of a cutting tool.

Cutting Fluid

If the life of a cutter in minutes is related to the cutting speed, a relationship such as the one shown in Fig. 6 will result. All cutting material shows a decrease in life as the cutting speed is increased, and, conversely, an increase in life as the cutting speed is reduced. Increasing the cutting speed is equivalent to reducing the actual machine cutting time between resharpenings of the cutter. This reduces the output of the machine by the downtime required to change cutters and increases the cost of resharpening and the prorated cost of the cutter per piece.

The use of cutting fluid, as a means to reduce the temperature of cutting, is definitely advantageous, since, when properly applied, a cutting fluid will permit a higher cutting speed than it is possible to have by dry cutting.

When it is found necessary to increase the production rate by resorting to an increase in the cutting speed, it is better to consider a change in the cutting material of the cutter, rather than to risk a loss in cutter life by increasing the speed of a cutting material already operating at an optimum speed. For example, if the cutter material is high speed steel and the cutter life is 60 minutes (Fig. 6) for which the cutting speed is 140 fpm, an increase of cutting speed to 150 fpm, or approximately 7 percent, will reduce the cutter life approximately to 30 minutes or 50 percent of the previous values.

By replacing the high speed steel cutter with either cast-non-ferrous materials or sintered carbide, it is possible for a cutter life of 60 minutes to obtain a substantial increase in speed by selecting a speed somewhat lower than that which corresponds to the 60 minute life.

Tooth Shape and Chip Space

The tooth shape and the chip space are closely related to the number of teeth in the cutter. A large number of teeth for a given cutter diameter will reduce the amount of chip space and the section of the teeth, and conversely, a small number of teeth will permit a better proportion between the section of the teeth and the chip space between them.

The teeth in a milling cutter may either be an integral part of the cutter or inserted in the body in the form of inserts or blades. The teeth should be made of ample section to withstand the cutting load and to provide sufficient material to avoid excessive temperature at the cutting edge.

CUTTER NOMENCLATURE

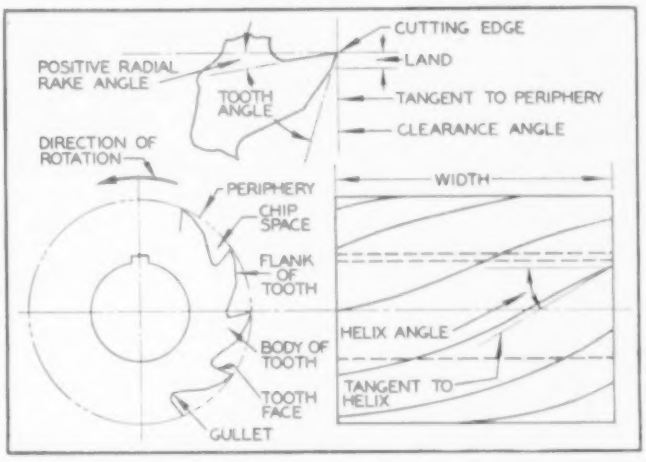

Fig. 7. Nomenclature of the plain milling cutter elements.

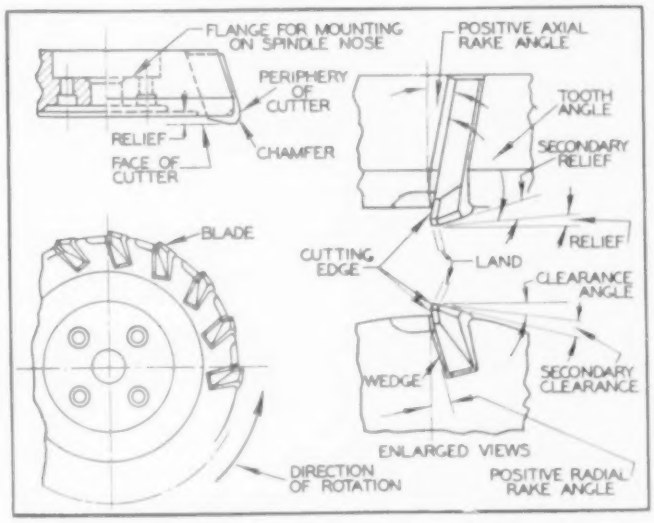

Fig. 8. Nomenclature of the face milling cutter elements.

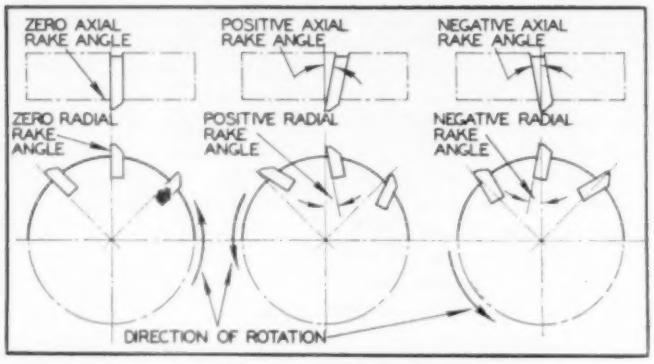

Fig. 9. Radial and axial rake angles in face milling cutters.

For good cutter performance the chip space should be correctly shaped and be sufficiently large to permit free flow of chips. Narrow pockets and sharp corners should be avoided, since they favor clogging or wedging of chips between the teeth and thus impair the life of the cutter. A rounding or gullet of large radius at the root of the teeth and a wide angle between them are necessary for unobstructed escape of the chips.

The advantage of a large chip space is most pronounced when a continuous chip is produced, as in the milling of ductile material.

Milling Cutter Tooth Cutting Angles

The cutting angles which are of particular importance in the use of milling cutters are: the *rake, corner or chamfer,* and the *clearance* angle.

Rake Angle

The rake angle is the angle at which is inclined the face of a milling cutter tooth with respect to a radial line, in the case of peripheral milling cutters, (Fig. 7), and with respect also to an axial line in the case of face milling cutters (Fig. 8).

In face mills there are two rake angles known as *radial* and *axial,* while in peripheral milling cutters, the axial rake is usually known as the helix angle. The rake angles can be positive or negative depending on whether the face of a blade or a tooth is inclined toward the direction of cutter rotation or in the opposite direction, respectively.

In the application of sintered carbide material to the milling of alloy steels, it has been found necessary to utilize the advantage of strength derived from setting the teeth at a negative angle. This has resulted in a combination of positive and negative angles, which are dictated by the particular conditions under which the cutter will operate. These various combinations are shown in Fig. 9.

With high speed milling cutters positive values of the rake angles are used. With a moderately high value of the

TABLE 1

Face Milling Cutter Rake Angles for Various Cutting Materials and Work Materials

Material Cut	Cutter Material: High Speed Steel		Cast Non-Ferrous Tool Material		Sintered Carbide	
	Radial Rake	Axial Rake	Radial Rake	Axial Rake	Radial Rake	Axial Rake
Soft Cast Iron	10°-15°	10°-15°	6°-8°	6°-8°	3°-6°	3°-6°
Mild Steel	10°-15°	10°-15°	3°-6°	3°-6°	0°-(—5°)	0°-(—5°)
Hard Cast Iron	10°	10°	3°-6°	3°-6°	0°-3°	0°-3°
Hard Alloy Steel	10°	10°	0°-3°	0°-3°	0°-(—10°)	0°-(—10°)
Aluminum and Alloys	20°-35°	20°-35°	10°-15°	10°-15°	10°-20°	10°-20°
Magnesium and Alloys	20°-35°	20°-35°	15°-25°	15°-25°	15°-25°	15°-25°
Yellow Brass and Bronze	10°	10°	5°	5°	3°	3°

rake angle between 10 deg and 15 deg, the flow of the material of the chip is improved over the lower values of the rake angle, to such an extent as to produce a superior quality of finish of the milled surface, increased cutter life. In addition, less power is required with a lower temperature at the tool point (Figs. 10 and 11).

The rake angle cannot be selected arbitrarily high irrespective of the operating condition. For heavy cutting on steel 10 deg and 15 deg rake angles insure good chip flow and leave enough metal for the needed strength of the tooth section.

For light cutting on steel, rake angle values of 20 deg to 25 deg are satisfactory and desirable because the cutting load is light and cutting temperature low, thus permitting higher cutting speeds with accordingly higher production rate than are possible in heavy cutting operations. When milling light metals, such as aluminum and magnesium alloys, the values of the rake angles can be safely increased to 30 deg and 35 deg. This applies also to milling cutters with teeth made of cast non-ferrous tool material.

When sintered carbide is used as the cutting material, special consideration should be given to the values of the rake angles to achieve the best resistance of this material to the cutting loads, especially when milling alloy steel. Sintered carbide is generally used in face milling cutters and suggested values of the axial and rake angles for milling different materials are given in Table I.

Part Two of this section will appear in the July Tool Engineer.

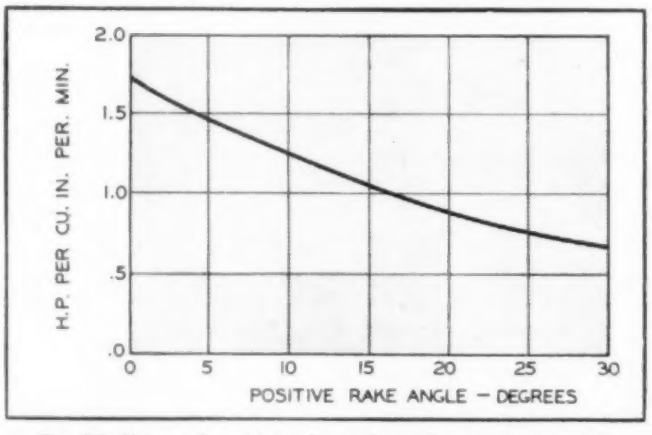

Fig. 10. Values of positive rake angles and power consumed in cutting.

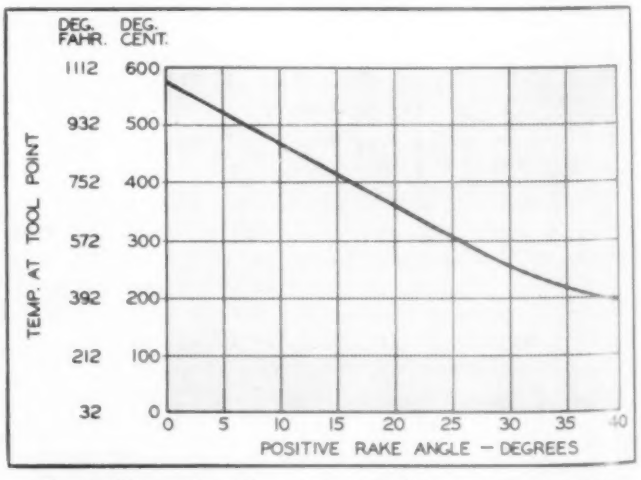

Fig. 11. Values of positive rake angle and temperature developed during cutting.

Another approach to the problem posed in The Tool Engineer, *January, 1949*

Solving Compound Angle Problems

By Jay N. Edmondson

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IN THE OPINION of the writer, there have been few, if any, solutions to compound angle problems of milling and drilling that have presented the problem in the light of three points met directly by the designer. They are:

1. The original design that caused a compound angle to be introduced. This in itself calls for certain calculations.
2. The graphical solution and the graphical design of the drill jig or mill fixture.
3. The calculated solution which will supply dimensions to the jig borer, for the accurate location of pins, bushings, etc.

Number 1 has many variations due to the product design. Let us assume a simple bracket, Fig. 1, consisting of a base with two holes, and a cylinder through which it is desired to

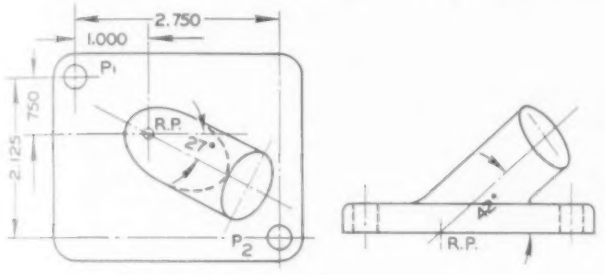


Figure 1

drill a central hole. Design of the unit of necessity called for a mounting base, doubtless in line or "squared" with the general structure of the machine, and held in place by cap-screws through the base. The placement of the cylinder at an oblique angle is evidently to accommodate a strut or member from this base to another unit of the machine, and therefore certain angle calculations will be based upon these requirements. This may be illustrated by Fig. 2, which shows two horizontal planes and the angle bracket carrying the oblique strut. Dimensions A, B, and C are tangent functions which determine the angles F *apparent* and H *apparent*, so called because neither is the true angle between the cylinder and the base, but are only the angles the centerline *appears* to make with horizontal and frontal planes.

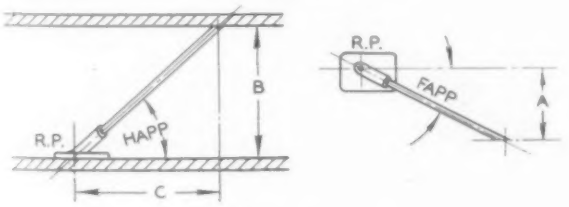


Figure 2

Note that the placement of the bracket on the plane is governed by a "reference point," labeled R. P., which is used as a *calculation* point *only*, to establish correct location from other units of the machine to the mounting holes of the bracket.

Fig. 1, shows the bracket with dimensions which are assumed to have been calculated from such a design layout. In other words, the centerline of the cylinder was found to be at apparent angles of 27 deg and 42 deg, intersecting the base at R. P.

If we rotate the piece about the 27 deg angle and tilt it up about *another* angle (*not* 42 deg), the piece will be in position for drilling. The graphical solution for the second angle is shown in Fig. 3 (orthographic) and Fig. 4 (pictorial) and is found to be 38 deg-44 min-21 sec in the trigonometric calculation. This is the true angle between the centerline and the base of the bracket.

In Fig. 5 the graphical layout is shown, and dimensions needed for the layout. Starting with the original placement of the part, the top view of the bracket will be the same, but little or none of the front view need be drawn. The first auxiliary view is taken perpendicular to the required centerline of the hole to show it in true size and at its true angle with the base, or 38 deg-44 min-21 sec. Therefore, the angle plate upon which the part rests can be drawn, after which the main base of the drill jig is drawn perpendicular to the centerline of the cylinder. Note that the angle plate will be at an angle complementary to the angle that the hole makes with the base of the piece itself. This will put the angle plate at 51 deg-15 min-39 sec.

Next, assume that a spherical ground plug of any suitable diameter, say 0.375, is placed at S. Its location is not important, but the solution for the locations of P_1 and P_2, the locator pins, can be considerably shortened if the ball is placed at a point having some relationship to the placement of the part. In this case it is placed 2.250 in. along the extended centerline (as seen in the auxiliary) from the assumed location of the reference point. In the top view it is placed $\frac{3}{8}$ in. out from the jig body, and the reference point 2.375 in. from the center of the sphere.

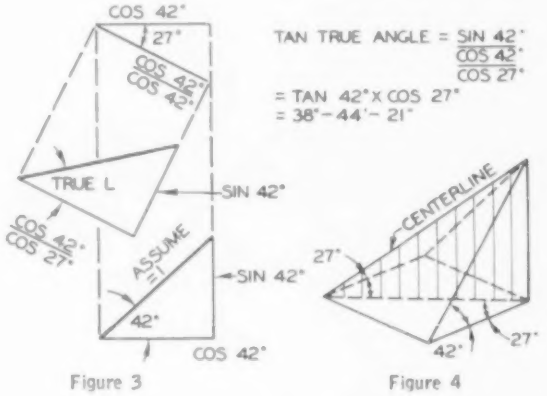


Figure 3 Figure 4

The problem resolves into determining the location of the pins P_1 and P_2, in order to position the piece on the angle plate of the jib. Note that the respective edges of the angle plate are parallel to the edges of the jig base; this greatly simplifies welding or other fabrication of the jig body, as compared with placement of edges at certain angles with the base.

The views as shown, top and auxiliary, may in the final drawing be placed with the base of the jig horizontal, (parallel to bottom of the sheet) though this is not often a requirement for those who meet these drawings in practice. Complete calculations, from beginning design sketches, be-

fore making the actual drawing, enable the designer to place the finished drawing in the most readable position. The solution for all dimensions follows:

SOLUTIONS

To review the problem, the following steps have been taken:

1. The true horizontal tilt angle was computed from the given angles of 27 deg and 42 deg (Fig 3 or 4).
2. In the graphical solution (Fig. 5) the base of the jig is established and the angle of the plate upon which the piece is located. This is a complementary angle.
3. For calculation and layout purposes, locate a spherical plug at an appropriate place, in top and auxiliary views.
4. Calculate the locations of the pins P_1 and P_2 from the center of the spherical plug.

Note that the positioning shown will permit drilling on a vertical spindle machine. For horizontal drilling the only change needed in the design is to change the new base to 38 deg-44 min-21 sec in the auxiliary, or "new front" view. If the position of the spherical plug is not changed, the top view dimensions to pins P_1 and P_2 do not change.

In the case of a mill fixture similar calculations exist for the locations of pads, pins, etc. Gaging surfaces may be established, for cutter positioning, referring their locations to the same spherical plug.

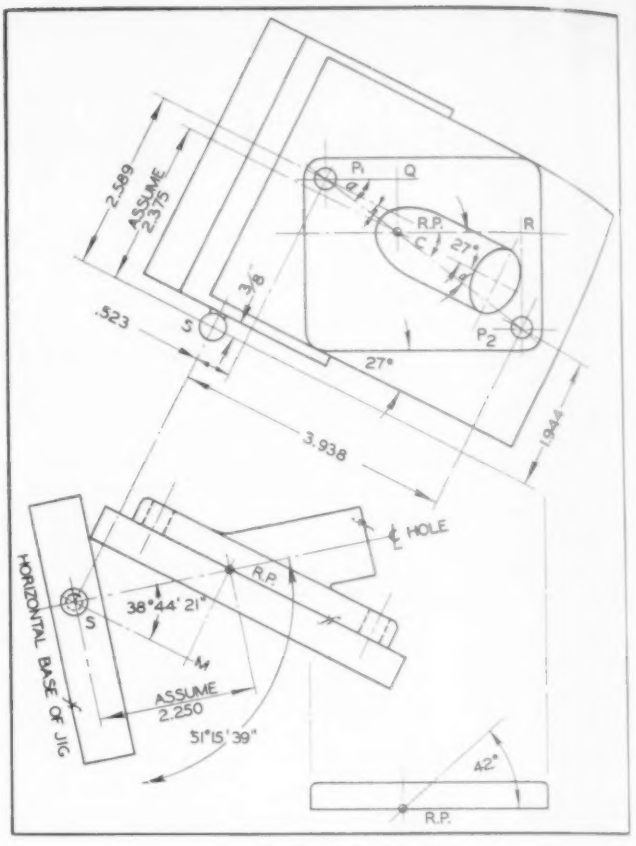
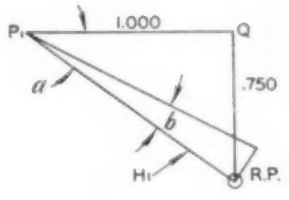


Figure 5

Trigonometric Solutions for Location of Pins P_1 and P_2



IN TRIANGLE P_1 — Q — RP

Solve for Angle a:

$$\text{Tan } a = \frac{.750}{1.000}$$

$a = 36° - 52' - 12''$

Less $27° - 0' - 0''$

Angle $b = 9° - 52' - 12''$

Length $H_1 = \sqrt{1.5625} = 1.250$

$1.250 \times \sin 9° - 52' - 12'' = .2142$

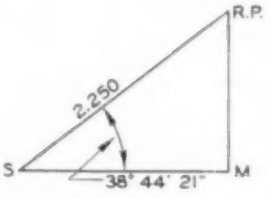
$1.250 \times \cos 9° - 52' - 12'' = 1.2315$

$.750 - 9.87506$
$1.000 - \underline{0.00000}$
9.87506
$36° - 52' - 12''$
$1.5625 - 2 \mid \underline{0.19382}$
0.09691
1.250
$1.250 - 0.09691$
$\sin b - \underline{9.23404}$
9.33095
$.2142$
$1.250 - 0.09691$
$\cos b - \underline{9.99353}$
0.09044
1.2315

Therefore $2.375 + .214 = 2.589$, which is the location of P_1 from the spherical construction plug in one desired direction.

6-954

IN THE AUXILIARY VIEW, TRIANGLE S-RP-M



Solve for SM: $2.250 - 0.35218$

$2.250 \times \cos 38° - 44' - 21''$ $\quad \cos - \underline{9.89210}$

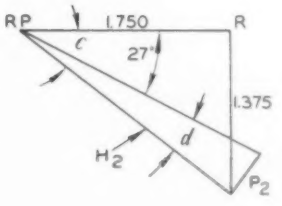
$SM = 1.755$ $\quad 0.24428$

Therefore

$1.7550 - 1.2315 \quad 1.755$

$= 0.523$, which is the location of P_1 from the spherical plug in the other desired direction

6-954



IN TRIANGLE P_2 — R — RP

Solve for Angle C:

$$\tan C = \frac{1.375}{1.750}$$

$C = 38° - 9' - 26''$

less $27 - 0 - 0$

angle $d = 11° - 9' - 26''$

$H_2 = \frac{1.750}{\cos c} = 2.225$

$H_2 \times \cos d = 2.1835$

$H_2 \times \sin d = .431$

$1.375 - 0.13830$
$1.750 - \underline{0.24304}$
9.89526
$C = 38° - 9' - 26''$
$1.750 - 0.24304$
$\cos c - \underline{9.89560}$
0.34744
$H_2 = 2.225$
$H_2 - 0.34744$
$\cos d - \underline{9.99171}$
0.33915
2.1835
$H_2 - 0.34744$
$\sin d - \underline{9.28669}$
9.63413
$.4306$

Therefore the location for P_2 would be

$2.375 - .431 = 1.944$
and $1.755 + 2.1835 = 3.938$

from the spherical plug

Inexpensive finishing method extends tool life threefold

Extending the Life of Tungsten Carbide Form Tools

By Charles A. McQuarrie

GENERAL ELECTRIC COMPANY

ALTHOUGH ENTHUSIASTIC reports of long life from tungsten carbide tools in many applications are common, one exception usually is on form tools (Fig. 1) with opposing cutting edges, where resharpening of the tool will reduce the overall dimensions more than tolerances will permit. Such form tools frequently are used in machining operations on aluminum and magnesium alloys that are to extremely close tolerances, often to tenths. Part, or all of this tolerance may be used by the toolmaker, leaving little or no opportunity to redress the tool for wear.

Starting with the assumption that a better finish around all cutting edges would improve the life of such a tool, a series of trials of various materials and methods resulted in finding a quick, simple, inexpensive procedure. Using a wooden wheel with a paste of diamond dust, the edge surfaces of the tool are burnished to a mirror finish, especially on the top surface. The wood is resilient enough to permit surface refinement without the usual attention to spindle accuracy or wheel concentricity. The cutting action is so slight that there is no danger of altering the form.

Measurements with a profilometer show that this finishing refines the surfaces from a range of 15 to 20 rms mu in., produced with conventional grinding; to 1 to 2 rms mu in. The effect on the cutting edge is a reduction from around 30 rms mu in. with conventional grinding, to as little as eight rms mu in. after refined finishing (Fig. 2).

Cupped wooden wheels, five inches in diameter and one inch thick are being used. Several types of material have been tried, including plastics; at present birch or maple is preferred, with a diamond paste of 600 grit. A surface speed of about 4500 fpm is satisfactory.

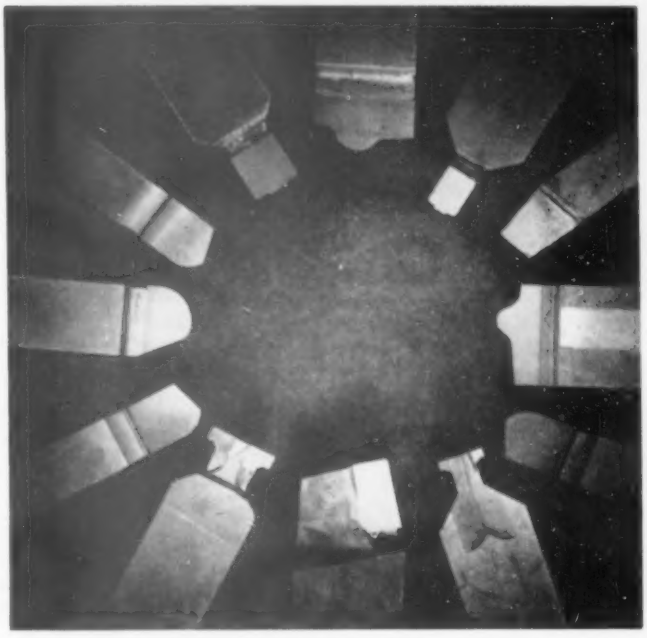


Fig. 1. Several examples are shown here of tungsten carbide tools on which refined finishing has given extended life.

So far, trials on refined finish have been confined to tools used on aluminum and magnesium alloys. On these, the life has been extended as much as three times that of the same carbide tools with conventional finish. Although polishing with diamond dust on a wooden wheel is not new, its application to refined finishing of forming tools appears to be novel. It has proved to be a simple, inexpensive way of extending the life of forming tools used on these alloys.

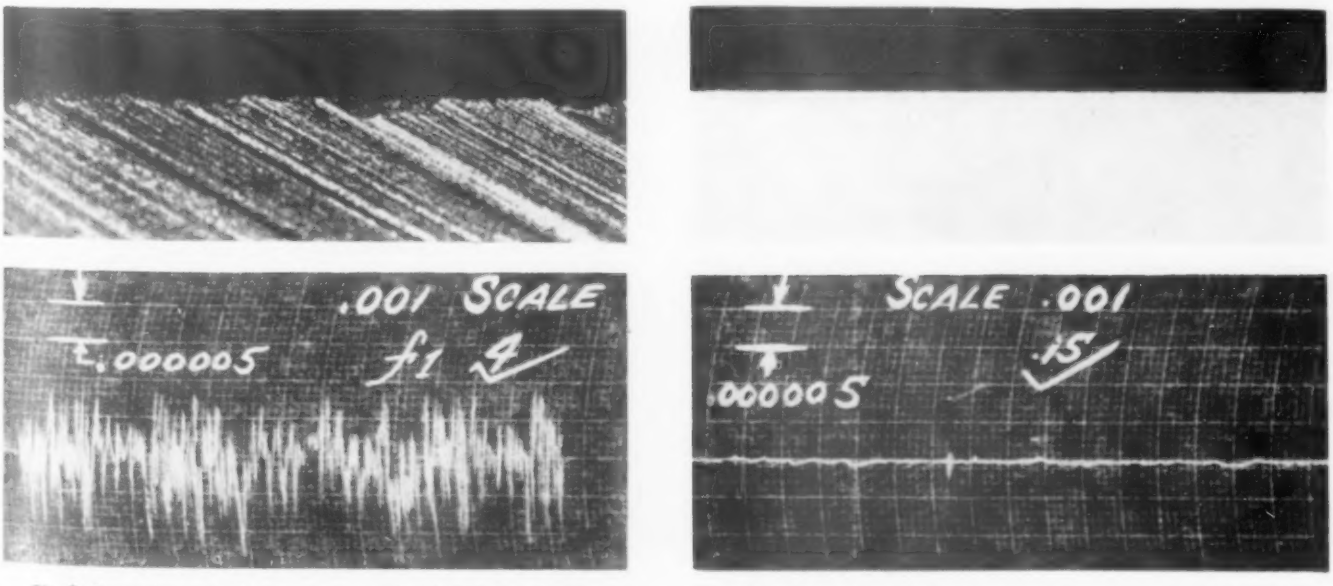


Fig. 2. Comparison of tool surface as ground with 240 grit diamond wheel (left), and after refined finish (right). The relative finish obtained by both methods can be seen from the microphotographs as well as the Brush analysis of each.

Economics play a dominant role in selecting the proper machine

Machine Tool Selection In the Turning Field

By E. L. Murray

THE WARNER & SWASEY CO.

TURNED WORK PARTS may be produced on engine lathes, tool slide lathes, hand or automatic turret lathes, both horizontal and vertical, single or multiple spindle automatics, and boring mills. There is one underlying principle involved in selecting the machine type for production of the turned part, and that is that the greatest return is obtained when jobs are produced on machines which provide *least cost* consistent with the *urgency* of the job and the *number of pieces* to be made.

The prime question is always *least cost*. It is dangerous to shop efficiency to generalize job placement by lot sizes alone as is the common custom in many shops. Least cost is the common denominator of urgency and the number of pieces to be made and it is secured only in ratio to the importance of these latter elements in the production scheme.

For example, the point of least cost is reached when the expense of production is level with the production return. Thus, a job lot of one thousand parts may be produced at less cost on an engine lathe than on a turret lathe if the operations are simple. The same number of another part may be produced at less cost on a multiple spindle automatic than on a turret lathe if the operations are complex.

From this it may be seen that lot sizes as such are (1) important only in their relation to least cost and are (2) variable depending on many other factors.

Before examining these factors in detail it should be understood that two distinct classes of work exist which require different methods of analysis for placement of jobs on proper turning equipment. The first group consists of those jobs whose physical characteristics are such that they may be conveniently machined on several types of turning equipment insofar as machine performance is concerned, and the second group comprises those jobs having unique physical characteristics which limit the machining process to turning equipment with adaptable specifications.

However, the problem of selecting a proper machine for any type of work may be helped by examining the workpiece with certain factors in mind: (1) Workpiece geometry. (2) Workpiece material. (3) Workpiece accuracy. (4) Personnel factors. (5) Total production.

I WORKPIECE GEOMETRY

One of the first points which is established when considering the machine type for a given workpiece is the size or shape of the work. This is of basic importance because machine clearances and working stroke requirements are involved.

Critical machine clearances on the engine lathe, turret lathe, and some single spindle automatics are usually defined by the swing-over bed ways, carriage wings, or cross slides. Greatest clearances of this nature are available on these types of machines due to design standards of the basic machine and the possibility of bed gapping, detachability of cross slide units, etc. Workpiece swing for other single spindle automatics and all multiple spindle automatics is usually limited to an area roughly equal to the diameter of standard equipment work-holding devices. On turret lathes, and single and multiple spindle automatics, the size and length of end working tools must be related to the clearance capacity of the turret on which they are mounted.

Engine lathes, turret lathes and tool slide lathes are "Universal" in the sense that working strokes are usually more flexible than those in single spindle automatics and multiple spindle automatics. That is, the cross slide units may be positioned and fed longitudinally under power along the machine bed or cross-wise according to workpiece requirements. The cross slides of single and multiple spindle automatics, of course, are normally fixed in longitudinal position and fed under power in a crosswise direction only. In addition, the length of tool slide working stroke is normally greater for equivalent capacity machines on the engine and turret lathes than on the automatics, which may be of value when continuous feeding across wide surfaces is required.

The possibility of automatic loading or unloading of work parts with suitable shapes, should not be overlooked in establishing the use of single or multiple spindle automatics. Such savings in handling time may justify the additional machine expense on borderline lot sizes when a choice must be made between a hand turret lathe and automatic equipment.

In some cases, the size of the machined diameters or length of cuts involved are not the only dimensions to be considered. If the machining requirements of the workpiece, for instance, demand piloted tools, then working stroke requirements are always greater than the length of the cutting stroke. Or, if a workpiece has appended arms or ears it is necessary to relate these dimensions to the machine size and type, rather than to the actual diameters on which the cuts are taken.

Special kinds of work as this are often encountered. An example might be a 25 in. diameter flywheel which requires only the machining of a 2½ in. hole for the shaft. Naturally, the swing required by this size work would seem to call for a large machine although the actual cutting operations are better suited to a smaller machine. For large production, this job could be placed on a small turret lathe with a gapped bed, thus securing the advantages of faster machine handling along with capacity to swing the workpiece.

Another tooling arrangement overcame the necessity of a large swing machine for a job which called for a medium lot size, with no assurance that additional lots would be scheduled. Therefore it was obvious that a turning machine with a large enough swing to grip the aluminum casting in a rotating fixture was too expensive.

As an alternate method, an indexing fixture was mounted to the cross slide of a smaller machine and the various cutting tools held in the collet chuck. The workpiece was machined on six sides by indexing the fixture and feeding the cross slide longitudinally into a series of replaceable cutting tool holders.

Holding Devices

The size and weight of the workpiece may determine whether horizontal or vertical loading will be most convenient and profitable. This is ordinarily not of prime importance for small diameter work, but when a workpiece reaches proportions where crane loading becomes necessary, then a close analysis of the job requirements is in order.

The assortment of parts shown above have physical characteristics such that they may be conveniently machined on several types of turning equipment so far as machine performance is concerned.

The shape of the workpiece determines the design and necessity for holding devices which in turn can influence the choice of turning equipment. Completely unsymmetrical work may call for the use of a four-jaw independent chuck or similar slow-acting holding device, which eliminates advantageous use of automatic or semi-automatic equipment. If the holding device is a fixture, its design will have considerable effect on the choice of machine. A simple fixture may be loaded quickly enough to be in conformity with an automatic cycle, whereas a complex fixture is likely to raise the cycle time beyond the point of profit on an automatic. In addition, the fixture may become so large or intricate in design as to eliminate the job itself from the multiple spindle automatic due to the multiplied cost of fixture investment and clearance requirements.

An illustrative case involves a very complex 5-position indexing fixture for locating a cast steel gate valve during the machining operations. Various surfaces of the valve are machined from each position of the fixture by the cutting tools mounted on the cross sliding hexagon turret.

The valve body is bench loaded into a box which holds it in relation to the cores of the valve. The box is in turn located in the trunnion cradle of the main fixture.

Since this type of job requires a close correlation of human skill and handling to machine performance, the job is ideal for a hand-operated machine which permits the necessary cycle interruptions for indexing the fixture, work loading, and placement of cutters.

Finished Work Surfaces

The amount of work to be done on a workpiece is frequently a clue as to the type machine on which it belongs. If the job is simple, with perhaps just one facing or turning cut to be taken, then the expense and flexibility of multiple spindle machines are wasted. This type of work, or residue work from other turning operations, exists in any shop and is usually routed to the engine lathe department. When of suitable size and shape, the complex workpiece having multiple steps or lengthy cuts often permits the splitting up of cuts, which is ideal for the multiple spindle automatic.

If a complex workpiece, which in many respects seems suited to an automatic cycle, calls for unusual types of machining cuts, such as deep drilling, turned diameters without withdrawal marks, intricate forming, or abnormal thread lengths, then it is worthwhile to investigate hand operated machines due to their lesser limitations on clearances, working stroke, and operator control.

Relation to Other Operations

The tool engineer must understand the requirements of the finished workpiece in order to fix the inter-related responsibilities of machines used in the total processing. If grinding, lapping, or honing are indicated then turning or boring tolerances are not likely to affect the machine choice. Special thread requirements may exceed the limitations of some turning machines and require rerouting the entire job to another type turning machine capable of handling the assignment. Or, the threading operation may be routed to specialized equipment.

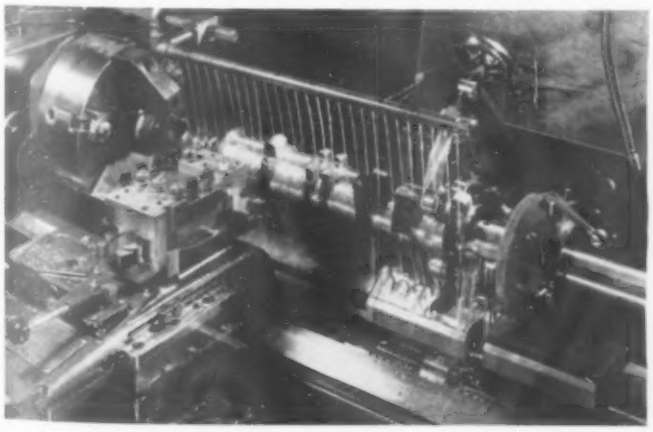
Most important is that the investment in these supplementary machines, the increased overhead, handling time, and effect on shop load must be considered along with the production value of the originating machine tool. In some cases, a slower producer which can handle the job completely may produce a less expensive piece than a faster originating machine which requires secondary operations.

Frequently, cross drilling, milling, back chamfering and back drilling, are called for on bar work. In such cases, conventional automatic machine attachments may be used to complete the job in one handling to improve work flow and reduce cost. Apparent production gains may prove to be fictitious until actual cost comparisons are made to prove the economy of such procedures.

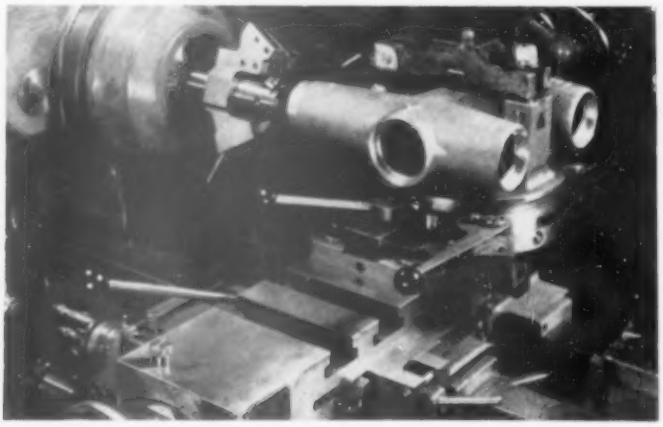
Concentricities and limits of parallelism and the possible methods of tooling to satisfy these requirements in a workpiece will affect the choice of machine types. If such jobs are done on multiple spindle automatics, the fundamental value of splitting-up cuts may be lost, depending on the shape of the workpiece, unless the operations are limited to roughing cuts. Such work parts may then be routed for finishing to engine lathes or tool slide lathes for "corrective machining."

Work Organization

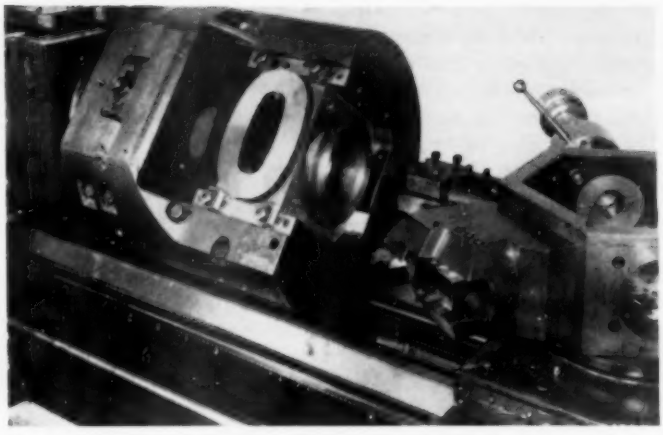
If possible, small lot shop orders should be organized so that jobs with similar shapes may be issued together. This



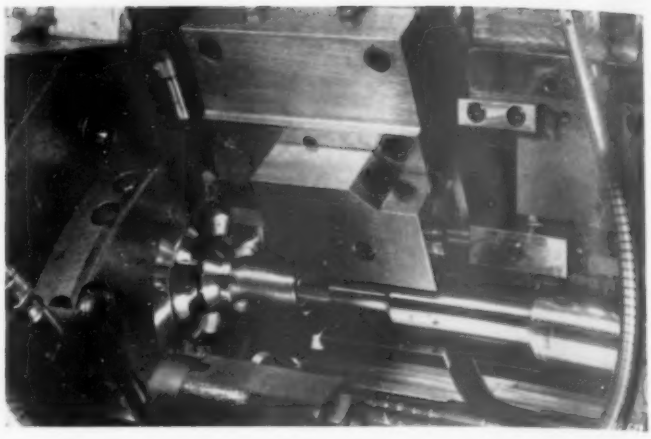
Above is a job having characteristics which tend to limit selection of machining process or equipment to those which possess adaptable specifications. This job is suitable to one type of turning equipment only—the hand turret lathe.



This tooling arrangement solved a production problem which called for a medium quantity, with no assurance of additional lots. First, an indexing fixture was mounted to the cross slide of an available machine; workpiece was machined by indexing the fixture.



Shown here is a complex five-position indexing fixture for locating a cast steel gate valve during machining. Valve surfaces are machined from each position by the cutting tools mounted on the cross sliding hexagon turret. The valve body is loaded into a box which holds it in relation to the valve cores, and which in turn is located on fixture.



How to overcome the tool withdrawal mark when using an automatic is illustrated here. The spring loaded cutter block is mounted on an upper cross slide of a multiple spindle automatic and pushed across the work by the upper auxiliary tool slide. This tooling eliminated a second cutting operation to remove the mark.

work may then be scheduled to machine types which are not profitable for individual small lots. For instance, bushings with identical outside diameters but with various sizes holes and lengths may be issued in series of small lots for tooling on a multiple spindle automatic because collet changing is eliminated and only a few minor changes in the turret tooling would be required. If these orders were issued separately in 50-piece lots, there is some question whether the average multiple spindle automatic could handle the work as inexpensively as the single spindle automatic or hand turret lathe.

If work parts have unique shapes or simple repeat surfaces, the use of specialized equipment may be justified for lot sizes to be calculated on a "cost-per-piece" basis. Stepped shafts or work with complicated contours may be produced by conventional methods on hand turret lathes, for instance, but only within limitations imposed by available tool stations and handling time. This same work may be more profitably routed to cam-operated tool slide lathes or turning equipment with automatic duplicating devices.

Under certain conditions, hand turret lathes may be equipped with special mechanically operated tools to produce curved contours. A typical arrangement, illustrated, is a standard turret lathe equipped with a cross feeding hexagon turret, on one face of which is mounted a special rack operated contour slide. One end of the rack is held in position by the swing clamp which is mounted on a fixed portion of the machine. As the turret feeds crosswise, the rack rotates the cam plate through a pinion gear in the tool holder. The cam moves the follower and thus the spring loaded cutter slide along the required path and permits the work illustrated to be generated.

A contour device such as this is relatively inexpensive and may be added to existing shop equipment or to a new turret lathe at the time of purchase. A supplementary advantage to the use of a mechanically regulated contour device is that it permits the use of the other tool stations for boring, reaming, etc., in the same operation which includes the contour cuts. This device and others like it may be removed from the turret lathe easily without destroying the usefulness of the machine as a standard turret lathe.

II WORKPIECE MATERIAL

Work parts are machined from every conceivable material and frequently the chemical analysis of the part determines to some extent the best type of turning equipment. For instance, some stainless steels are work hardening; copper is adhesive and difficulty is encountered with chip control; brass requires high speed for efficient cutting; and special precautions must be followed to eliminate the fire hazard attendant on cutting magnesium.

When work hardening stainless steel is machined on the multiple spindle automatic, the method of tooling must be arranged so as to minimize the effects of dwell which would create a glazed surface and break down the edge of the cutter.

Heat Treatment

The machinability of the workpiece at the time of cutting exercises a great effect on the type machine considered advisable for the job. For example, a workpiece with a sufficiently low value of machinability which calls for a large number of cutters, as in a multiple spindle automatic setup, may require too much maintenance and attention to quality control to operate at a very high cutting rate. The over-all cost computed under these conditions may indicate that the part may then be more profitably routed to a hand operated machine where better control and simpler cutter setting is available.

The matter of chip disposal is not to be overlooked in the selection of a machine type. Tangled masses of stringy chips are sometimes difficult to remove from the cutting area on horizontal machines, and may, in the case of automatics interfere with the tooling itself. Drilling holes whose depths are many times their diameter on multiple spindle automatics is not particularly an easy operation. If the material should be copper, special attention must be given to getting the chips out of the hole to prevent seizure of the drill.

Normally, difficulties such as these may be overcome provided tooling cost is not especially a factor. However, they become elements in considering whether a job is profitable on a multiple spindle automatic, which should operate with a minimum of attention from the machine operator, or whether it should be put on a hand turret lathe where control is had over each phase of the cycle.

Occasionally work with hard spots or sand inclusions is encountered, as in steel castings, which may determine the type turning equipment most likely to be profitable. Hard spots and extreme abrasiveness of the work material are indicators against the use of the automatic cycle, particularly of the multiple spindle variety. Along with these characteristics may be an unusual or unequal distribution of stock allowance, which in some cases must be adjusted for in the individual workpiece. Hand operation control may be more desirable under these circumstances.

III WORKPIECE ACCURACY

The limits of accuracy to which the various types of turning equipment may operate are variable and it is difficult to properly classify them on this basis. It is generally true, how-

ever, that some workpiece accuracies may require more tooling investment on one machine than another, and this obviously is a factor which must be included in any analysis of machine types.

Quality control bears a direct relationship to workpiece accuracy and can very definitely affect the type machine selected. It is ordinarily not considered good practice to permit a high degree of quality control at the multiple spindle automatic, since this is economically secured on the hand turret lathe. Lot sizes of work which might otherwise be considered suitable for a multiple spindle machine may under these circumstances be more profitably produced on the hand operated machine.

The matter of maintaining cutting edges has been referred to under Workpiece Material. It is also of specific importance to the maintenance of workpiece accuracy and if elements in the tooling setup required to machine a certain workpiece indicate that the maintenance of cutting edges would be a problem, then the job should be considered for a machine which allows the use of a simpler setup.

IV PERSONNEL FACTORS

Among all of the personnel factors which enter into the selection of a type of machine, skill is perhaps the most important in some shops. In other words, the skill available will determine to some extent whether jobs may be placed on hand turret lathes or on some other type machine. Frequently, due to a lack of available skill, some jobs which might well be machined on multiple spindle automatics, would call for the simplification of operations across two or three other types of machines in order to balance the skill available to the total machining of the work.

Stabilization of Handling Time in the Production Cycle

This is a very popular consideration at the present time which many machine shops are using to justify the installation of automatic equipment. In other words, the fatigue element and other factors have lent impetus to the installation of single spindle and multiple spindle automatics which, by virtue of their automatic control, stabilize machine handling time.

Jobs which might, in many respects, qualify for any of several types of turning equipment may be correctly scheduled to hand operated machines due to the necessity for difficult forming for finish or for size control. It is axiomatic that one characteristic of an ideal job for an automatic cycle machine is that it be possible to permit the job to operate on an automatic cycle without an abnormal amount of attention. When this is not the case, then "feel of the job" becomes important and the hand screw machine may be indicated.

Labor Distribution

This is one of the economic considerations which makes the multiple spindle automatic departments and single spindle automatic departments profitable places to machine parts. In other words, one operator may spread his attention over four single spindle automatics or two multiple spindle automatics with a consequent reduction in the cost of the workpiece. It is important to note that rate setters should consider the importance of evaluating the operator properly across two or more machines. A simple ratio may not exist between the operator's time and his machine; for example, if one machine operator produces work on one multiple spindle chucking automatic, then the handling time naturally would apply entirely to the work going across this one machine. If two multiple spindle chucking machines are operated by the same operator, it has been found that up to a certain point his time may not have to be divided equally between the two machines, but a lower percentage, such as 30 percent of the handling time, may be applied. In other words, the reduction in effective handling time accelerates with the increased number of machines among which each operator spreads his time.

V TOTAL PRODUCTION

The importance of this element in machine selection cannot be overestimated. While not the entire story, it is probably the most popular method of determining which types of machines may produce certain jobs most profitably.

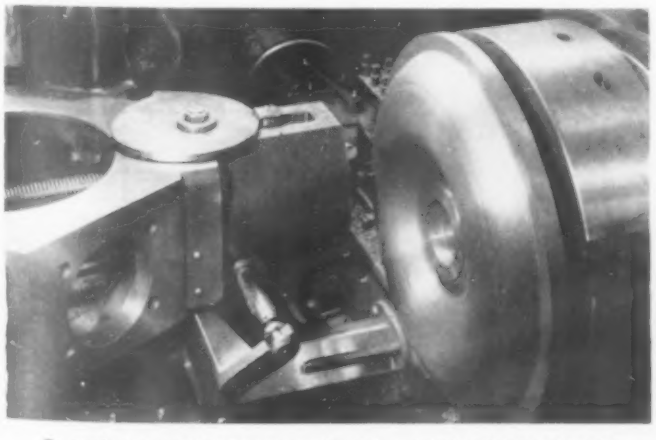
Among the many factors directly involving lot sizes and frequency is their relation to the machine hours available. This introduces the matter of machine loading, which qualifies to some extent the possibility of assigning jobs to certain types of machines already in the shop.

Total production always involves a comparison of setup time and producing time for different types of turning machines. It simply is not profitable to produce a short run job on a multiple spindle automatic when an extremely long setup time is involved. Conversely, a long run job on a hand turret lathe wastes the economies of automatic cycling, provided all other factors as previously outlined are favorable.

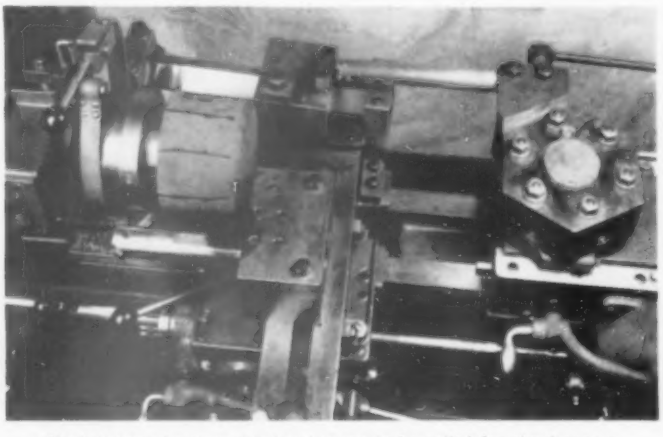
Economics of Tool Cost Recovery

A finely balanced relationship exists between a slower basic producing unit, which could be equipped with special tools to accelerate its production rate, and an inherently faster producing unit. In other words, the tooling possibilities should first be checked for a basically slower producing unit, because this type unit is normally less expensive than a basically faster unit, before concluding that the faster unit is desirable on the job.

When it is desired to determine the production quantities



To produce curved contours on a hand turret lathe, this machine is equipped with a cross feeding hexagon turret, on one face of which is mounted a special rack-operated contour slide.



The job turned out on this hand turret lathe called for simultaneous straddle facing and taper turning, plus a radius forming operation; an example of special tooling enabling a machine to produce at a rate unusual for its type.

of a certain job where equal cost exists if it is tooled on a turret lathe with (1) standard tools, or (2) with special tools, the example shown at I in the chart may be helpful. Here a method is shown of determining quantity of work, where equal cost per piece exists, of job "X" setup on a ram type turret lathe using predominately (A) Standard tools, (B) Special tools.

It may be seen that, if job "X" is tooled up to the maximum production rate on the hand turret lathe, the point of equal cost per piece is reached when the quantity reaches 14,000 pieces. That is, a minimum of 14,000 pieces are required to pay for the increased tooling investment resulting in the faster production time.

Below this quantity, it is cheaper to produce on the turret lathe equipped with standard tools *unless* the *urgency* of the job supports the increased investment in special tooling.

Economics of Machine Cost Recovery

If it is required to determine whether job "X" belongs on the turret lathe equipped with special tooling or on a single spindle automatic, the method shown at II may be used.

The facts here show that the cost of special items plus setup is higher on the slower producer for even the first piece. Under these circumstances the additional proof needed of the desirability of the faster producer is whether sufficient parts are scheduled each year to write off the difference in annual depreciation, and how many pieces are required to pay for the investment.

From the figures, it is seen that the difference in annual depreciation is $329.00. Therefore, since the actual difference in cost per piece is .0997, a minimum annual production of 3,300 pieces will sustain the increased depreciation over the book life of the machine.

Actually, the machine will pay for itself sooner, if enough parts are available for steady production. That is, the total investment of $11,850.00 divided by the savings per piece of .0997 requires that about 120,000 pieces be produced for total write-off.

The single spindle automatic can produce about 17 pieces per 52 minute hour or 34,000 pieces in a 2000 hour work year which would require 3.5 years of steady production to return the entire investment on the basis of the lower cost per piece.

Suppose that it is further desired to compare the advantages of the turret lathe equipped with special tools against a suitably tooled multiple spindle automatic. This comparison is presented at III.

Here again the cost of special items plus setup is higher on the slower producer and it is sufficient to calculate the sustaining production for a 15 year write-off, and how much production is needed to pay for the investment.

In this case, the difference in annual depreciation is $768.00 and the actual difference in cost per piece is .217. Therefore a minimum annual production of about 3,500 pieces is required for normal retirement of the equipment.

This machine will also return the investment quickly.

It can produce about 104,000 pieces per year and only 85,000 total pieces are required for total retirement.

One more commonly encountered problem in cost analysis remains.

Reviewing briefly, we have seen that if a machine shop wishes to choose between a standard tooled hand turret lathe and a turret lathe equipped with special tools the following holds true:

	Total Production Required	Period of Recovery
Example I	14,200 pieces	About 6 months

Also if a comparison is wanted between tooling the job on a turret lathe equipped with special tools and on a single spindle automatic, then:

	Total Production Required	Period of Recovery
Example II	120,000 pieces	3.5 years

And comparing the job as tooled on the turret lathe with special tools with the multiple spindle automatic:

	Total Production Required	Period of Recovery
Example III	85,000	9.7 months

As a final comparison, assume that a choice must be made between a single spindle automatic and a multiple spindle machine. This will be seen in Example IV.

In this case, the first piece is more expensive on the faster producer than on the slower. The point of equal cost is calculated to be 3100 pieces. In other words, it takes 3100 pieces to pay for the difference in cost of special items and setup to justify the use of the faster machine.

If then, as per this final comparison, it is strictly a question of justifying the entire investment in the multiple spindle machine the following figures would apply:

	Total Production Required	Period of Recovery
Example IV	160,000 pieces	1.5 years

JOB CHART ON MACHINE SELECTION

I		II			III		IV	
A	B	A	B		A	B	A	B
Standard tools	Special tools	Ram type turret lathe, specially tooled	Properly tooled single spindle automatic		Ram type turret lathe specially tooled	Properly tooled multiple spindle automatic	Single spindle semi-automatic chucking machine	Multiple spindle automatic
$1,234.75	$ 59.50	$6,500.00 59.50	$10,750.00 750.00	Cost of machine Cost of standard tools	$6,500.00 59.50	$17,325.00 750.00	$10,750.00 750.00	$17,325.00 750.00
		$6,559.50	$11,500.00	Total cost of standard items	$6,559.50	$18,075.00	$11,500.00	$18,075.00
82.32	3.97	437.00	766.00	Depreciation of standard items at 15 yr. rate—yearly depreciation	437.00	1,205.00	766.00	1,205.00
.041	.002	.218	.38	Considering 2000 hr. of yearly operation—hourly depreciation	.218	.603	.38	.603
2.541	2.502	2.718	2.88	Total overhead, with standard overhead rate of $2.50, excluding depreciation	2.718	3.103	2.88	3.103
1.50	1.50	1.50	.75*	Rate per hour for direct labor	1.50	.75*	.75*	.75*
4.041	4.002	4.218	3.63	Total labor and overhead per hour	4.218	3.853	3.63	3.853
.0673	.0667	.0703	.0605	Total labor and overhead per minute	.0703	.0642	.0605	.0642
		2.5	3.5	Setup time, hr. (estimated)	2.5	6.0	3.5	6.0
		$ 10.55	$ 15.33†	Setup cost (labor + overhead + setup)	$10.55†	$27.618†	$ 15.33†	$ 27.618†
197.00	2,616.70	2,616.70	350.00	Cost of special items depreciated in one lot	2,616.00	700.00	350.00	700.00
6.5	4.0	2,627.25 4.0	365.33 3.0	Total of special items and setup cost Production time per piece, min. (est.)	2,627.25 4.0	727.618 1.0	365.33 3.0	727.618 1.0
$ .43745	$ .2668	$ .2812	$ .1815	Cost per piece (labor and overhead x production time)	$ .2812	$ .0642	$ .1815	$ .0642
$ .17065		$ .0997		Difference in cost per piece	$ .217		$ .1173	
$ 2,419.70				Difference in cost of special items plus setup charge			$362.288	
14,200				No. pieces required to equalize cost per piece			.3100	

*Use 50% of $1.50, assuming same operator runs another machine. †Use full rate of $1.50 per setup.

Redesign of equipment effects marked manufacturing economy

By A. E. Rylander

Output Trebled by Tooling Changes

How output per machine was first doubled, then trebled by a practical approach to a production problem is typified in the hobbing of window regulator arms at the plant of the Detroit Hardware Manufacturing Company, Detroit. These arms, shown in outline in Fig. 1, have a segment worm wheel hobbed as indicated on special 2-station hobbing machines built by Michigan Tool Company, Detroit. The parts are hobbed right and left hand, and the machines cut right-hand on one cutter head and left-hand on the other.

In the original setup, one piece was hobbed at a time, the cutter naturally entering on the horizontal center line of the part. Later, as demand for the product increased, plant production executives conceived the idea of hobbing two pieces simultaneously. The work-holding fixture was therefore lowered so that the spindles centered on the parting line of the two workpieces. At this stage of development, the parts were manually clamped with floating cam-actuated clamps, as indicated in Fig. 2.

Even with this setup, production failed to keep pace with demand. Consequently, a second machine was ordered. This unit, a collaboration between Detroit Hardware and Michigan Tool engineers and shown in the background, Fig. 3, was designed to hob three pieces simultaneously. The spindles center on the center line of the intermediate workpiece, as in the original setup for a single piece. Also, automatic pneumatic clamping superseded the original manual clamping. The older unit—shown in the foreground, Fig. 3—is too light to hob three pieces; however, it was reworked to include the pneumatic clamping and other recent Michigan Tool Company refinements. To all practical purposes, the two machines are otherwise quite similar, except that the newer unit incorporates hobs of larger diameter.

In this connection, hobbing two or three parts simultaneously imparts a slight crosswise radius in the teeth of the parts; however, this is so slight as to make no difference in the operation of the arms. A close-up of the fixtures, with pneumatic clamps, is shown in Fig. 4. The two parts shown indicate their relation to the older machine.

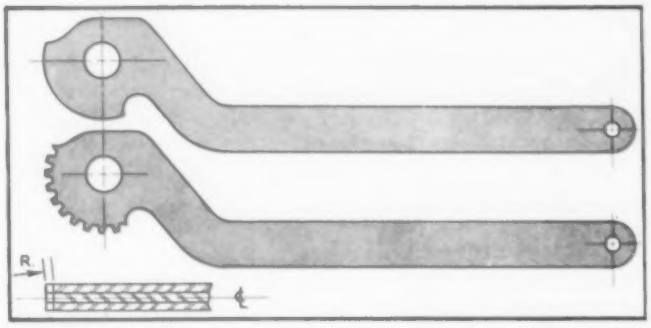


Fig. 1, above, shows an outline of the window regulator arm. Originally, the teeth were hobbed one part at a time, but are now hobbed two and three at a time as a result of changes in setup and machine design. The cross-section detail at lower right shows how the hob is centered with the center line of the intermediate part. The slight curvature or radius in the teeth, imparted as a result of off-center hobbing, makes no appreciable difference in the operation of the parts.

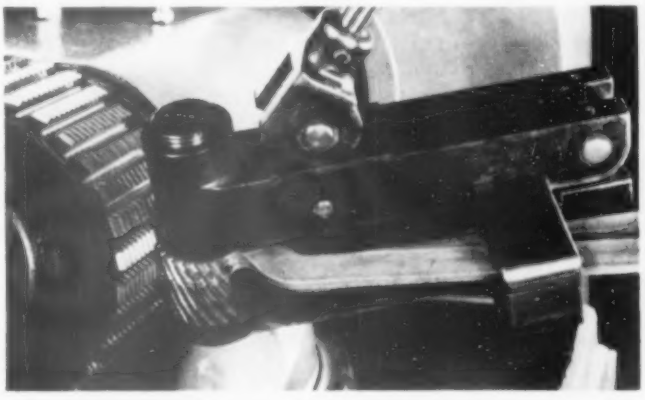
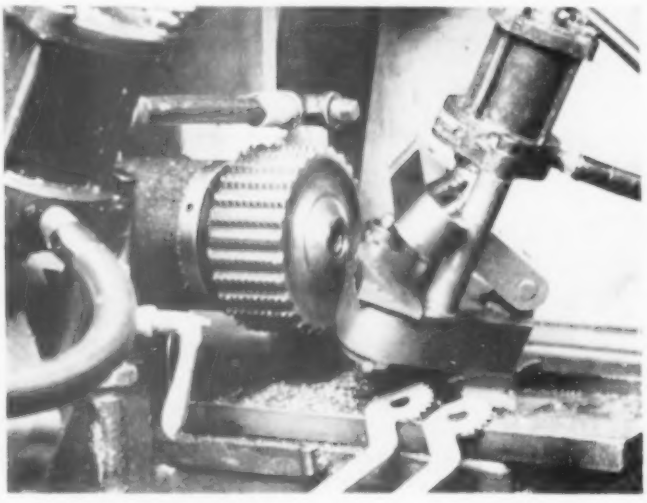


Fig. 2, at right, is a close-up of the parts in position for hobbing. This is the older setup in which the parts were clamped by a floating cam-action clamp. Otherwise it is similar to the later development, by Detroit Hardware Manufacturing Company production executives in cooperation with Michigan Tool Company engineers, in that three parts are hobbed simultaneously. Note the staggered arrangement of the parts to insure that the hobbing starts in the correct location on each part.

Fig. 3. The original special hobbing machine is shown in the foreground, with the later development in the background. The machines incorporate two working stations, one working while the other is being unloaded and loaded. When a fixture has been loaded the operator presses a button for that station. The pneumatic clamps then close on the work and the machine starts its automatic cycle. In the meanwhile, the adjacent station is completing its cycle, and the operator merely swings from one station to the other as the parts are hobbed. Fig. 4, at right, is a close-up of the improved fixtures with pneumatic clamping. While only two parts are shown, (older machine) three parts are hobbed simultaneously on the later model.



Longer life at reduced cost are among the advantages of

Hard Surfacing for Increased Wear Resistance

By Gilbert P. Muir

THE ADVANTAGES OF hard surfacing in extending the life of parts subject to a considerable amount of wear are being accepted increasingly by industry today. At the same time, improved materials and a greater variety of available analyses have both broadened the field of the process and have contributed to a further savings in costs.

Hard facing can be accomplished by either gas or electric arc welding. Both have their advantages in specific applications, but the acetylene process probably has the edge in total volume of usage.

The factor of prime importance in preparing for a hard surfacing job is the selection of the proper material to be applied to the part, and this, of course, depends upon the end use of the part and the conditions to which it will be subjected. Table I presents a summary of some common hard facing materials and their resistance to several factors, including abrasion, erosion, corrosion, heat, impact and thermal shock. Study of these conditions will frequently reveal that the part is subject to more than one, which necessitates the selection of an alloy which will handle a particular combination of factors. For example, again referring to Table I, type 1 alloy is harder than type 2, but the latter is tougher and stronger, and will take a keen cutting edge.

One significant application of hard facing in the die field is the coating of hot trimmer dies used in the trimming of ring gears and many other forgings, both of carbon and alloy steels. Type 2, the cobalt-chromium-tungsten hard facing material is the type most widely used for this application, as shown in Fig. 1. For hot-work punches and dies, particularly when the operation calls for thermal shock, another alloy, type 5, is coming into wide use. This combines a nickel base material with additions of Cr, Mo, W, and Fe.

Where parts are subject to severe abrasion, such as coal undercutter bits, either type 1 or type 4 is suitable, with the latter having the edge because of greater wear resistance. An example combining both abrasion and considerable impact can be seen in a manganese steel crusher mantle, where type 3 was recommended and found successful.

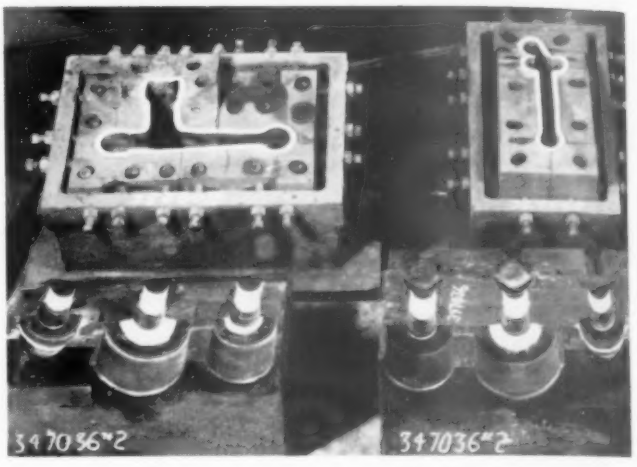


Fig. 1. These dies for hot trimming forgings are a prime example of current die applications for hard surfacing.

Resistance to corrosion is a variable quantity because, while most hard facing materials combine a degree of corrosion resistance with other properties, service conditions of the part range from mild to severe. The use of hard facing on aircraft valves is an example of this, and here, in addition to considerable corrosion, the part encounters heat, abrasion and impact. Hard facing of these valves added significantly to their service life. In this case type 2, a high tensile cobalt-chromium-tungsten alloy was found to be well suited to the job.

Preparation of the Part

The surface of the part to be hard faced should be thoroughly cleaned by grinding or machining until it is bright and free from all dirt, scale or other foreign matter. All sharp corners should be rounded off. If only a small section of the part is to be hard surfaced, a shallow recess or groove

Table 1—Guide to Selection of Hard-Facing Materials

Type	Hard-Facing Material	Characteristics of Hard-Facing Materials: Resistance to: Abrasion	Erosion	Corrosion	Heat	Impact	Thermal Shock	Applied by	Hardness (as Deposited)	Tensile Strength, Psi	Special Properties
1	High-hardness cobalt-chromium-tungsten alloy	S	S	S	G	—	—	O-A Arc	54 Rockwell C 45 Rockwell C	47,000	Wear resistance
2	High-tensile cobalt-chromium-tungsten alloy	G	S	S	S	S	G	O-A Arc	31-40 Rockwell C 31 Rockwell C	105,000	Resistance to wear, heat, erosion and shock
3	High-chromium iron alloy	G	G	—	—	S	—	Arc	40-45* Rockwell C 26-30 Rockwell C	40,000	For manganese steel parts
4	Rods with tungsten carbide grains in a steel matrix	S	—	—	—	—	—	O-A	.....	.....	For earth-moving and agricultural equipment
5	Nickel-base alloy (with Cr, Mo, W, Fe)	—	G	S	S	S	S	Arc	200 Brinell	72,000 to 80,000	Resistance to thermal shock and heat; machinability

S = superior; G = good; — = not outstanding; * = after work hardening.

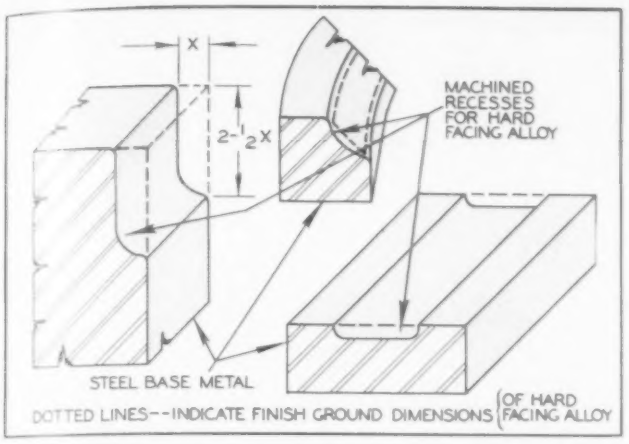


Fig. 2. At A (left) is shown the proper machining for hard facing of a part such as a punch which will be subjected to shock. Parts not subject to severe impact can be machined as shown at B (center). When the alloy is to be applied over a longitudinal area, the part is machined as at C (right).

to receive the material can be made either mechanically or with a cutting tip.

When hard facing a punch, shear blade or die, where the corner is to be subjected to shock, the part should be machined similar to *A* in Fig. 2. This width ratio of two or three to one provides proper support of the alloy for any vertical shock, and at the same time will withstand horizontal stress.

The example shown at *B* in Fig. 2 should be followed where the part will encounter no severe impact. This drawing illustrates the procedure for machining a steel exhaust valve prior to hard facing. If the wear resistant alloy is to be applied to a longitudinal area, the part should be grooved with radii of the same length as the depth of the groove, as shown at *C*.

In all cases where it is impossible to grind or machine the part, it may be filed or chipped, but in any event it must be thoroughly cleaned.

Preheating

In general, the same rules apply to preheating prior to hard facing as apply to most welding operations. For medium sized parts, preheating should be done with a neutral flame (assuming the oxy-acetylene process) to about 800 deg F. For smaller parts, the necessary preheating can be done with the welding flame while applying the hard facing rod. On larger parts, to avoid scale the part should be preheated in a furnace.

Hard Facing Procedure

In hard facing steel the blowpipe tip should be adjusted so that it has an excess acetylene feather which, measured from the tip, is about three times as long as the inner tip. This carburizing flame lends a little surface carbon to the steel and thus converts a thin surface film to a high-carbon steel with a lower melting point than the base metal. The film will glaze over and appear to sweat before any significant part of the base metal is heated to its melting range. This is the condition required for hard facing.

The blowpipe is held so that the flame is directed at an angle of from 30 to 60 deg to the surface, with the tip of the inner cone about 1/8 in. from the surface of the steel. When the surface has begun to sweat, the welding rod is inserted between the inner cone of the flame and the hot steel, with the rod lightly touching the inner cone and the steel. If the steel is at the sweating point and the flame is properly adjusted, the molten alloy pool can be spread over the sweating area with the flame alone, without any stirring with the rod. If the alloy pool must be spread by being puddled with the rod, the resultant bond will not be as strong as if the metal were allowed to flow by itself.

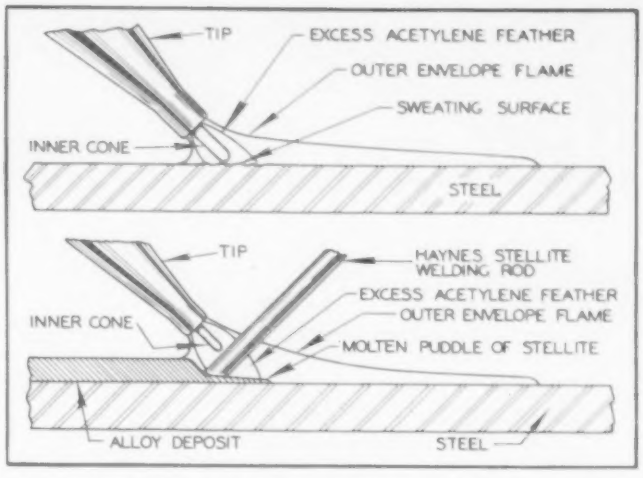


Fig. 3 (top) shows proper flame position to produce sweating on the part to be hard surfaced. At bottom is the relationship between rod, tip and work during hard facing.

Cast iron will not sweat in the manner of steel, hence when this metal is the base material a little less acetylene should be used in the flame. The hard facing material does not flow as freely as on steel, and it is generally necessary to break the surface crust with the end of the rod. In addition, care must be taken to insure that the base metal is not melted too deeply.

Hard Facing Alloy Steels

Steel generally can be easily hard faced with the exception of high manganese (Hadfield) steel. Monel can be hard surfaced easily; copper is difficult; and brass and other alloys of low melting point cannot be hard faced with the cobalt-base rod. Nitralloy is hard faced successfully if a good brazing flux is spread on the surface before the part is brought to red heat. The nitrided case should be ground off that portion of the surface to be hard faced.

High speed steel should be fully annealed before it is hard faced. The heat should be kept as even as possible during the welding operation, and after welding the part should be brought up to an even red heat and allowed to cool slowly.

Stainless steel has a higher rate of expansion than the low carbon grades, and therefore should be evenly heated and slowly cooled to prevent uneven internal stresses. It is recommended that large pieces be heated in a furnace to a dull red heat and be allowed to cool with the furnace.

In general, as has been previously mentioned, procedure is similar to welding. The electric arc process, not covered here, is suitable to a great number of applications, and for some, such as hard facing manganese steel, it is preferred to the oxy-acetylene process. Considerable savings accompany hard surfacing in most instances, and the increased wear obtained from parts formerly subject to rapid replacement adds to its importance. In applications such as small tool bits where a number of parts are to be hard faced simultaneously, simple jigs and holding fixtures will step up production considerably and further reduce cost.

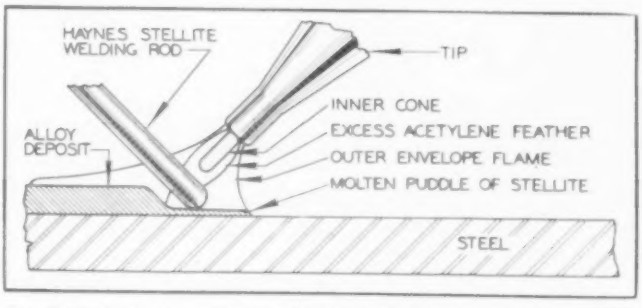


Fig. 4 illustrates the procedure when hard facing is done by the backhand method.

Part two of a series on Design for Resistance Welding

Flash and Upset Butt-Welding

by E. J. Del Vecchio

SWIFT ELECTRIC WELDER CO.

BUTT WELDING is a term applied to any process of welding in which the ends of two metal bars, rods, sheets or plates are butted together, heated and fused into one piece. In a resistance butt weld, the heat is generated at the joint by the resistance offered to the passage of an electric current through the work pieces and the joint.

If the two pieces are held together with sufficient force or pressure to prevent arcing or flashing at the joint, it is an upset butt weld. When the two pieces contact lightly, however, passage of current through the joint will be accompanied by arcing and flashing, in which case it is a flash weld. Regardless of the method of heating, the weld is completed by the application of sufficient force to thoroughly forge the two pieces together.

Each method has its own applications. Upset welding is used mostly on wires and small rods and bars. It also finds wide application on tubing of various sizes, and practically all welded chain is upset butt welded. A similar application is the electrical cutting of stranded cable, but in this case the process is actually reversed. The cable is placed in dies, then a current passes through it, melting and parting the cable and at the same time fusing the individual strands together to prevent fraying.

Flash welding, as previously outlined, requires that the two pieces contact lightly to permit flashing. This flash is actually composed of molten particles of metal blown out of the joint, and in order to permit the flashing to continue, the pieces must be fed together, but still under very light contact, or practically no pressure. When the joint has become sufficiently heated, upset is applied and the weld completed.

The action of the upset causes an extrusion of the metal at the joint which must usually be removed by grinding, machining, or other means.

Speed vs. Strength

An upset weld is much faster than a flash weld, but the strength and consistency are usually less. If the ends of the parts are properly prepared, and the process is rigidly controlled, both consistency and strength of an upset weld can equal a flash weld, but this additional control and preparation are usually prohibitive from a cost standpoint.

The extrusion or upset resulting from an upset weld can, however, be more readily controlled than on a flash weld. This is a distinct advantage on pipe or tubing where the extrusion or upset may be difficult to remove. In cases where the cost can be justified, this upset bulge can be virtually eliminated.

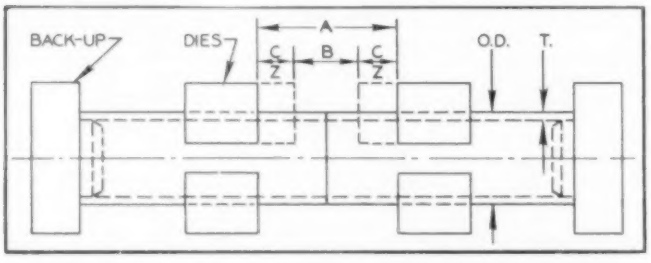


Fig. 1. Above are shown in simplified form the elements of a flash weld. The initial die opening is at A, while the final die opening is indicated at B. The stock lost during the flash and upset is shown at C. Outside diameter of the tube or bar is labeled at OD, and T indicates the wall thickness of the tube or thickness of the sheet.

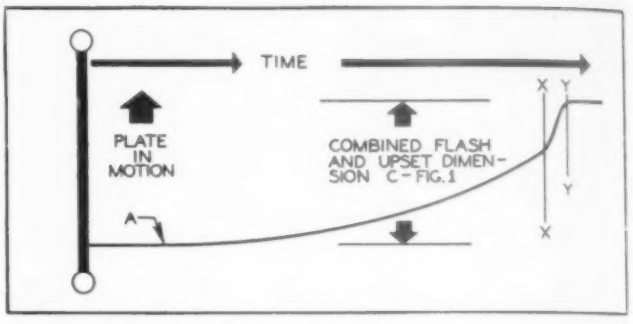


Fig. 2. In this flash welding chart curve A represents platen motion plotted against time. Starting at time 0-0, the rate of feed is slow and increases at constant acceleration to line X-X, where the metal is heated sufficiently to apply upset force. Time between X-X and Y-Y is that required to complete the upset and should be as short as possible. Current is applied at time 0-0 and cut off at time X-X. In some cases current may continue partly over the upset, but should never be cut off before X-X.

While an upset weld requires proper preparation of the abutting ends—usually by a machine operation—no preparation is required for a flash weld. Actually, rough abutting faces are often an advantage.

Providing for Stock Loss

Both upset and flash welds result in a certain amount of stock loss, and this must be provided for in the design of the parts. Fig. 1 shows the principal factors involved in flash welding and Table I gives values of die opening, stock loss and welding time for various stock sizes. At *A* is the die opening for loading or starting the weld, *B* is the final die opening, and *C* represents the stock lost in the weld. In the table, *B* and *C* are omitted, but they can be assumed to be equal and each of them equal to half of *A*. These dimensions are not critical and may vary considerably. Too much stock for flash and upset, if not excessive, will merely make the welding time longer, while too little flash and upset might result in poor welds. All of these factors will also be affected

Table I—Flash-Butt Welding Data for Mild Steel Refer to Figure 1

Flat Sheets and Tubular Sections			Round and Square Bar Sections		
T	A	Flashing Time (seconds)	O D	A	Flashing Time (seconds)
1/64	7/32	3/4	1/16	1/8	1/2
1/32	5/16	1-1/4	1/8	7/32	1
3/64	9/16	2-1/4	3/16	3/8	1-1/2
1/16	5/8	2-3/4	1/4	7/16	2
3/32	7/8	4-1/2	3/8	5/8	3
1/8	1-1/8	6-1/2	7/16	3/4	3-1/2
3/16	1-11/16	11	1/2	7/8	4
1/4	2	16	5/8	1-1/16	6
5/16	2-1/4	21	3/4	1-1/4	8
3/8	2-1/2	30	7/8	1-7/16	10
7/16	2-3/4	38	1	1-5/8	13
1/2	2-7/8	45	1-1/4	2-1/16	22
9/16	3	50	1-1/2	2-1/2	38
5/8	3-1/8	60	1-3/4	2-7/8	60
3/4	3-3/8	75	2	3-1/4	90
7/8	3-1/2	95	2-1/2	3-7/8	120
1	3-3/4	110	3	4-1/2	180

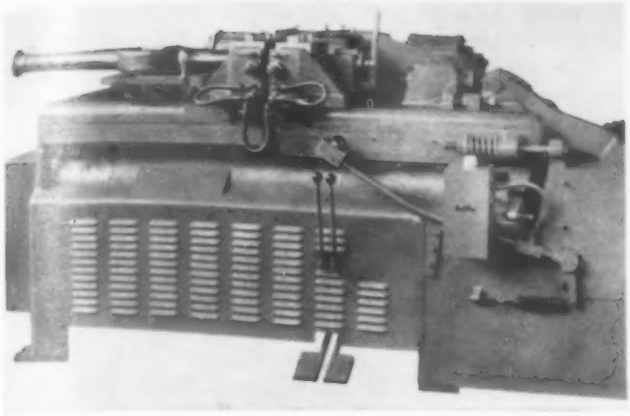


Fig. 3. This motor-operated flash welder features air-operated horizontal clamping fixtures for welding flanged forgings to automotive rear axle housings. Platen flash and upset motion is imparted by a cam through a bell clamp or lever.

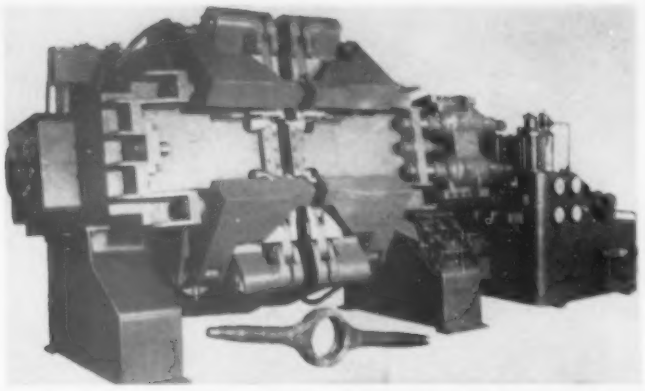


Fig. 4. Automatic hydraulic welder with clamp fixtures for welding two halves of rear axle housings. Platens of the machine are set at angle of 85 deg from horizontal to facilitate loading. Fixtures and backups are designed to produce finished parts with exact overall length and with a true circle in the banjo opening.

by the type of machine used and its electrical and mechanical capacity.

Fig. 2 shows a graph of platen travel plotted against time. Curve A would represent the cam contour on a motor operated machine and the platen motion of a hand operated machine would be provided by the hand lever. Automatic hydraulic machines also have similar motions.

A typical flash welding machine consists of a table type frame upon which are mounted two platens, one of which is stationary and electrically insulated from the frame, and the other, which operates on ways on the frame. Fixtures for holding the work are mounted on these platens and are connected to the terminals of the welding transformer which is mounted in the frame of the machine. During the welding operation, it is necessary to move the movable platen toward the stationary platen at a prescribed rate of speed to maintain flashing action. This may be accomplished by means of hand lever, motor driven cam or hydraulic cylinders.

The hand operated welder is particularly desirable for light work where production is not the first consideration, and where runs are short. It is ideal for job shop and repair work. Except for die changes, no set-up is necessary, and the operator quickly acquires the knack of consistent results. Due to the fact that it is under the control of the operator, its welding capacity is considerably greater than the motor operated type.

Motor operated machines are the preferred type for maximum speed and production, especially where the weld area is not too great. The motor drives a speed reducer, usually through a variable speed drive. The slow speed shaft of the speed reducer carries the welding cam, which, either directly, or through lever or bell crank, imparts the required motion to the platen. Timing cams for turning current on and off, as well as for opening the clamps are also mounted on the main cam shaft. Starting and stopping may be accomplished with a dog-tooth clutch or start-stop motor. Fig. 3 shows a typical motor operated machine.

Hydraulic machines are preferred for the larger sizes, especially where considerable flexibility is required. Several types are available, the simplest being one in which a hand operated valve controls the flow of oil to the cylinder. This operates the same as a hand operated machine except that hydraulic power is substituted for the hand lever. Other types of control provide semi-automatic and full automatic operation. Practically all very large machines are of this latter type, as shown in Fig. 4.

Hydraulic power is provided by a separate, self-contained pumping unit incorporating pumps, sump tank, inter-coolers, strainers, flow control or hydraulically driven cam control valve and other accessories.

Standard clamping fixtures are of two principal types: Vertical—usually with alligator or rocker arm action (Fig. 5); and horizontal (Fig. 3)—in which the moving dies operate in a horizontal plane. Either type may be hand, air or hydraulically operated, directly or through lever, toggle, cam, wedge or eccentric motions to intensify the clamping force or pressure.

Vertical clamps are generally the fastest and are used for small rods and bars, also for strip, sheet and plate up to a maximum of about 20 in. wide. Beyond this width, a gate type clamp is used with true vertical motion and pressure applied at both ends of the clamp.

The horizontal type is used for larger bars and tubing. Most horizontal fixtures have both front and back current-carrying dies for a better distribution of current throughout the weld. This is of considerable importance with tubing.

Back-ups are frequently used, (and always desirable) for resisting the upsetting force. If they are not used, this force must be resisted entirely by the clamping fixtures. Adequate back-ups also permit lighter clamping fixtures to be used.

Machines Sizes Standardized

Flash welding machines have been standardized by the Resistance Welder Manufacturers' Association into five sizes as shown in Table II. This standardization is intended to provide a balance of electrical and mechanical capacity in each size.

It is rather difficult to tabulate butt welding machines in terms of welding capacity due to the many variables involved. A rule of thumb method, however, is to allow 100 kva per square inch of cross section. This applies to low carbon or SAE 1010 steel, but is subject to considerable modification depending on whether the weld section is concentrated as in a square or round bar, or flattened, as in a sheet. Further revision must be made if the welded piece is a band, and this will depend on the ratio of band diameter to cross section.

Upset pressures can be estimated at 7500 and 10,000 psi of weld area for low strength (SAE 1010) steel, 10,000 to 18,000 psi for medium strength (including most low-alloy steels) and 20,000 to 35,000 psi for high strength (stainless) steel.

Clamping pressures are estimated at two or three times upset pressure. If serrated or knurled clamp jaws can be used, the clamp-upset pressure ratio may drop to 1-1, and if the work can be completely backed up, only enough clamp

Table II—R.W.M.A. Standard Flash Welder Sizes

Size	K.V.A. Rating	Upset Force (lb)
1	20	2,250
2	50	4,500
3	100	11,500
4	150	19,600
5	250	38,000

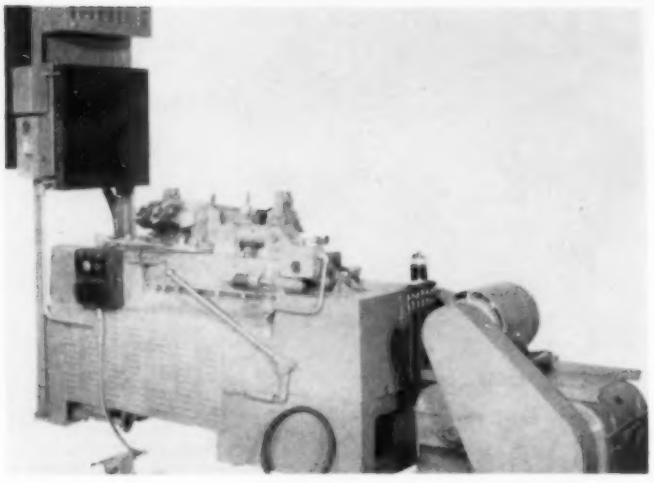


Fig. 5. Air-operated vertical clamps are employed in this motor-operated flash welder for the production of fly-wheel ring gear blanks. Electrical controls on the left of the machine are used in automatic annealing of the weld zone in the machine immediately after welding.

pressure is required to provide good electrical contact and prevent buckling in the jaws.

Other factors involving the capacity of the machine for a given job are the required production speed and the type of operation, that is, whether hand, motor or hydraulic.

Parts being flash welded may be identical or different in composition: one of the most important applications of flash welding is the joining of materials of different analyses. Some common applications are welding forgings or castings to bar steel; stainless to carbon or low alloy steel, high speed to low carbon steel. The latter is very common and almost universally used in the manufacture of high speed drills, reamers, shear blades and other tools.

Nor is the process confined to steel. Aluminum, magnesium, nickel, monel metal and many brass and bronze alloys are readily flash welded.

Carbon vs. Weldability

The carbon content of ordinary carbon steel does not particularly affect its weldability, but it does influence its subsequent heat treatment. Up to about 0.25 to 0.35 carbon, heat treatment after welding is unnecessary; from 0.35 to about 0.65, heat treatment can sometimes be done in the welder itself, or the entire part subsequently furnace treated. Beyond 0.65 percent, it is generally necessary to put the welded part quickly into a furnace to prevent cooling checks caused by the steep temperature gradient at the weld.

Any successful flash welding application requires that the parts be properly designed for the operation. There are three simple rules, which if followed, take care of most cases:

1. Provide sufficient stock for flash and upset.
2. Provide ample space for clamping.
3. Provide identical cross-section on each end.

Fig. 6 shows a few typical examples of flash welds. At *A* are two rods, bars or tubes of equal cross-section. When the composition of each is the same, the weld line will be halfway between the dies, provided the joint was midway between them at the start. If the materials are different, the burn-off may not be the same on each piece, necessitating one extending further out of the dies than the other. It can be seen at A_1, that when the parts are of unequal thickness, the small tube tends to telescope into the large one. If the difference between diameters or cross section is considerable, the large diameter should be necked down for a sufficient length to accommodate the upset as shown at *B*. Failure to neck the large piece down will result in a condition as shown at B_1. Most of the burn-off will come from the small piece, which will tend to burn a hole in the large one. The weld line will be inside the large piece, and due to the inequality of heat in the two pieces, the weld will not have full strength.

The line of upset force should be parallel to the axis of the bar or rod. If this is not true, as at *C*, the bar ends may bend and that part of the weld at the apex of the angle may not be sound, due to lack of solid metal immediately back of the weld line.

For obvious reasons, a weld such as shown at *D* is impractical. If the two diameters are equal at the start of the weld, the small piece will cut through the large piece before the weld can be made. The only remedy is to flare the large tube and swage the small one for a distance along the ends to give a uniform diameter to both pieces.

One very common application is the welding of miter sections such as used in window sash, as shown at *E*. This is a "Z" section and each piece is clamped at an angle of 45 deg to the line of upset force and with the two legs flat on the machine in step dies. Due to lack of supporting metal, the outer leg will be forced out as shown at "X", but the extrusion can be trimmed or ground off, leaving a sound weld. The inside of the angle at "Z" has very little extrusion, and the weld is sound. The web of the section at "Y" gets no weld at all, because after the extruded part is removed, no metal is left. For this reason, it is common practice to notch the web section back just far enough so that the two ends of the web will just contact or close up. This leaves the overall joint just as strong, much better in appearance and with much less finishing after welding.

If weld flash or extrusion must be removed, this may be accomplished by chipping, machining or grinding. For flat sheets, where the weld is in a straight line, trimming machines similar to a shaper are available for trimming in a single stroke. Formed sections, such as automobile rims and rings may be trimmed in rotary or oscillating machines in which the cutters are contoured to the section.

Alignment, concentricity and run-out can be maintained within reasonable limits, but cannot be held perfect due to the fact that the dies, which are non-ferrous and relatively soft cannot be sufficiently maintained. If perfection is required, such as with piston rods, the parts should be slightly oversize and completely machined after welding.

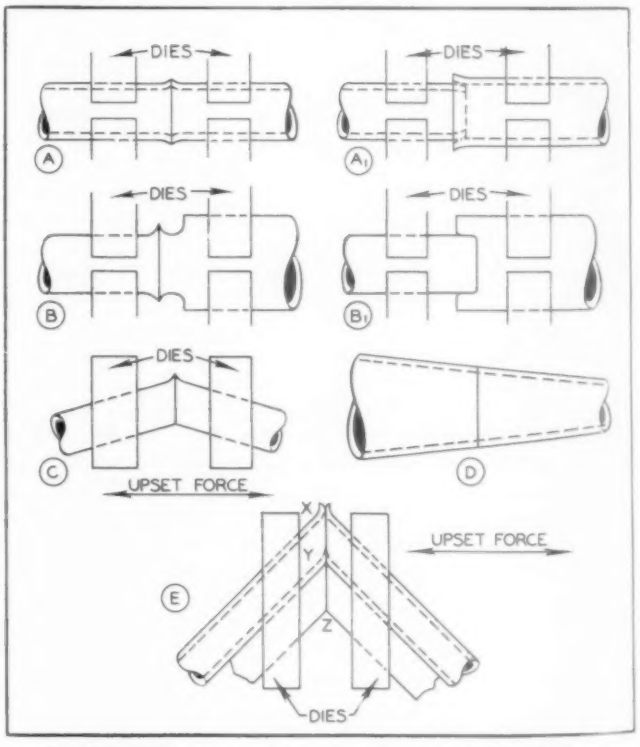


Fig. 6. Several common joints encountered in flash welding are shown above, together with solutions to the problem of unequal OD of stock.

designing for efficiency

Gang Milling Fixture

By Robert Mawson

THE EFFICIENCY of a milling fixture may be determined by the percentage of idle or non-productive time to the complete cycle or in and out period. If a tool is designed in which a cutter is removing material all the time this equipment would be considered 100 percent efficient.

In Fig. 1 is shown a dog coupling which is used on a special type of machine. The detail is made of a machine steel forging and the first operations are machining the two ends, reaming the 0.2215-0.220 in. hole, then drilling and tapping the 10-32 in. hole and countersinking the other end of this hole.

The next operation is milling the $^{3}/_{32}$ in. long slot and the fixture used for this work is shown in Fig. 2. This fixture is made with a cast iron base finished on the surfaces "f". On a machined surface of the base a machine steel locating plate is fastened with two socket head screws and a dowel pin. Finally eight slots are machined in the proper locations, to suit the gang cutters and slightly wider than these cutting saws.

At the ends of the locating plate two locating bars are attached, each with three socket head screws and two dowel pins. Openings are then machined in the bars in the proper positions to suit the gang-cutter set-up and for a depth suitable to hold the workpieces securely.

Machining Fixture

On the angular machined ends of the base two machine steel clamps are placed, each with a shouldered pin at its lower end to act as a fulcrum. Each clamp is provided with a square headed screw tapped into the fixture body. Between the head of the screw and outside face of the clamp a steel washer is fitted, and on the inside face of the clamp, resting on the fixture base, is a tension spring.

The upper or contact face of the clamp is machined so that it will be parallel when contacting the workpiece—to aid in holding it in proper alignment, a piece of drill rod may be placed against the side of each clamp.

The fixture is located on a machined plug and also by a pin which fits a bushing in the milling machine index table. The fixture is then held securely on the table with bolts placed in four holes machined in the base of the fixture.

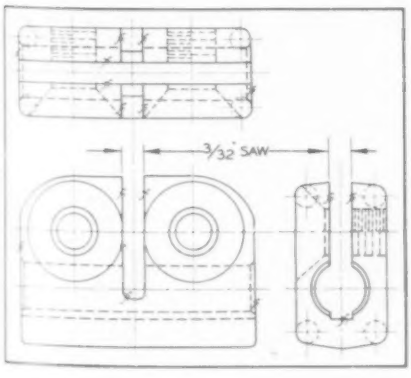
To use the gang milling fixture, the fixture is first located, as described, on the machine table and held in position with bolts placed in the table and through the four holes in the fixture base. All nuts are then tightened to hold the fixture securely. Four $^{3}/_{32}$ in. milling saws, with the proper widths of spacing collars, are placed on an arbor and fastened in the head of the milling machine.

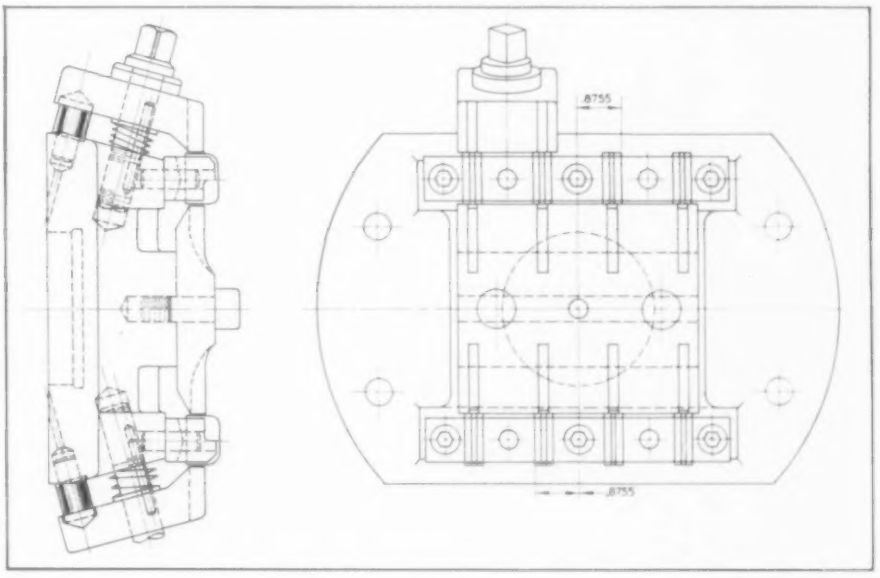
Four of the dog couplings are then placed in the openings in the rear locating bars, after which the two clamps on this side of the fixture are now tightened to hold the workpieces against the locating plate. The machine table is adjusted for height to obtain the correct depth of cut, the machine is started in operation and the table, carrying the fixture, is fed under the revolving cutters. This setting of the cutters for height is done, only when setting-up a new job.

While the first four pieces are being machined the operator is placing four additional pieces in the fixture on the forward side. When the workpieces, in the rear side, have been milled the table is fed back from the cutter path and the table is indexed for 180 deg. or half a revolution. The finished pieces are now in the front or forward position of the fixture. In this location, which is handy for the operator, the fixture is fed in to machine the four pieces which have been positioned and are now at the rear. During the time these are being milled the previously machined pieces are removed and other four parts are located ready for indexing.

Main advantage of the fixture is the fact that the only lost or unproductive period is the time required for indexing, which may be either by hand or mechanically between the milling cycles.

Fig. 1 (below), illustrates a dog coupling used on a special machine. For machining the coupling, the fixture shown in Fig. 2 (right) was developed. Fixture is located on machine table, four couplings are clamped in place, then table is fed under revolving cutters.





By J. W. Lengbridge

Types and Functions of Press Tools

Installment No. 14 of a Series on the Theory and Practice of Pressing Aluminum

Press cutting tools vary considerably in design, arrangement, size and cost. Regardless of all this, however, they fall into following four general types or combinations of types:

1. Simple cutting tools, which cut one blank, pierce one hole or group of holes at each stroke of the press, thereby completing the cut on the product. For example, a tool cutting one blank per stroke, or piercing one or more holes in a previously cut blank or drawn shell, is termed a simple cutting tool.

2. Multiple cutting tools, comprising two or more simple cutting tools assembled to a common holder and which complete two or more products at each stroke of the press.

3. Progressive cutting tools, which are arranged to complete the work at two or more stations. When material is passed through these stations progressively, a portion of the work is done at each station; yet, work is done at all stations simultaneously. For example, a tool which pierces the stock at one station, and blanks out the pierced area at the next station, is a progressive cutting tool.

4. Compound cutting tools. These tools perform more than one cutting operation at one station and, by completing all of the cutting at the one station, also complete the work. For example, a tool which cuts the blank and pierces it at the same time, at one station and with one stroke of the press, is a compound cutting tool.

The following brief descriptions, together with illustrations and explanatory captions, will explain the principles designating the four types of cutting tools.

Simple and Multiple Cutting Tools

Simple cutting tools are designed for use when cutting blanks for strip stock, or for piercing holes in pre-cut blanks or drawn shells. When blanking from strip stock, the material is moved across the die through a guide which keeps it central with the die opening. The blanks are cut one at a time and are caught in a receptacle under the press. Since material has a tendency to cling to the punch, a stripper is necessary to free the material from the punch. When piercing shells or blanks, the work remains on the die and the scrap piercings are pushed through. Typical examples of simple cutting tools are shown in Figs. 129 and 130.

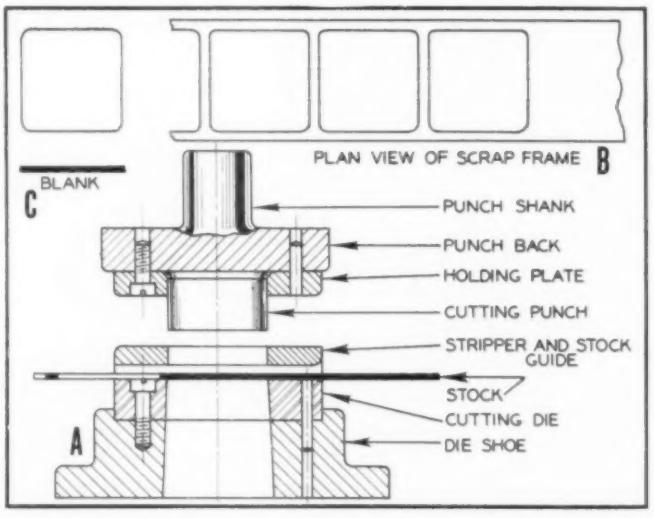
A simple cutting tool is not necessarily a cheap tool. For instance, a perforating tool cutting several hundred small holes in a blank, and costing $1000.00 or more, may be a simple cutting tool in principle yet falls into the same category as a tool cutting one hole and costing only $50.00. The two tools shown in Figs. 129 and 130 would produce the pierced blank shown in Fig. 130-B in two operations on two comparatively inexpensive tools. This would be the logical procedure for a small-lot run in which accuracy is not critical and where tool cost must be kept low. With larger quantities, one or both of these tools could be designed to produce more than one cutting per stroke in multiple tools.

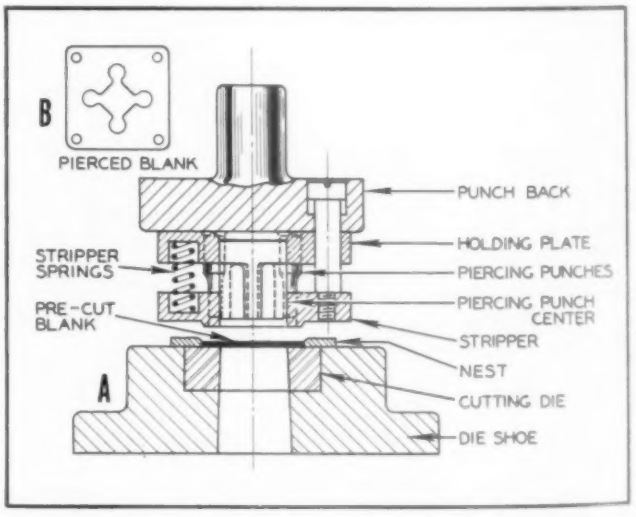
Progressive and Compound Cutting Tools

Multiple or gang tools, of which a typical example is shown in Fig. 131, are similar in general design to simple cutting tools except that they are arranged to cut two or more blanks at each stroke of the press. The register of the stock over the die opening is important on any tool having more than one cutting station. On multiple tools, the bridge between blanks is usually quite narrow and, should the stock be off register, the bridges are cut through and result in incomplete blanks. Feed stops are used to correctly position the stock, and of these there are several types to choose from, some of which will be described later.

Multiple tools are designed to perform the same operation on two or more blanks at each stroke of the press. In order to perform more than one operation on each blank,

These articles are a collaboration between the author, Mr. Lengbridge, and the Aluminum Laboratories, Ltd., of Kingston, Ontario.





Figs. 129 and 130, at left and right respectively, are typical examples of simple cutting tools. A, Fig. 129, shows a tool assembly in section with the arrangement and location of the various components designated by name. B is a plan view of the scrap frame as it appears after a few blanks have been cut. A feed stop—not shown—governs the width of the bridge between blanks. The stock guide locates the stock centrally over the die opening and prevents the cut from taking place too close to the edge of the stock. The cut blank is shown at C.
The piercing tool shown in Fig. 130 also falls into this type. The cross section at A is essentially the same as for the tool at left, except that a nest is used to locate the blank in the die and a spring-type stripper is used to strip the blank from the punches. Rubber is sometimes used in place of springs when the tool cost must be held low. The pierced blank is shown at B.

however, the tool may be arranged to do a different operation at each station as the stock moves along. This would imply a progressive type tool.

Progressive tools are those in which there are two or more work stations, each performing a different operation. They are usually designed to produce one completed unit at each stroke of the press, but may also be designed for multiple production. The stock is moved across the die from one station to the next, and the amount of stock movement controlled by feed stops. This type of tool is not confined to cutting operations only; rather, the stock may be progressively pierced, formed, embossed, and so on, and the completed part blanked out at the last station. A progressive tool for producing the pierced blank in Fig. 130-B is shown in Fig. 132.

In contrast with multiple tools, feed stops are not usually sufficient to guarantee exact register on progressive tools. As an aid to correct location, therefore, the blanking punches are often fitted with pilots. The feed stops spot the stock reasonably close to the correct position, and the pilots are shaped and located so as to enter the previously pierced holes just ahead of the blanking cut. The pilots then move the stock the slight amount it may be off register. However, extreme accuracy of location even with the aid of pilots is usually difficult on any tool in which the stock must be moved from station to station. When the accuracy of location between the cut blank and the pierced holes is critical, a compound tool may be used.

A compound cutting tool is one designed to do all the cutting at one station, thereby more or less eliminating the possibility of error of location. Tools of this type are particularly useful for producing pierced blanks to close dimensional and flatness tolerances. A typical example is shown in Fig. 133-A, with the "workings" explained in the caption. It might be added, here, that the cutting die on a compound tool illustrates the difficulty in naming these tool parts. It is "cut into" in the center, and "cuts with" on the outside contour; however, it must be described as a cutting die.

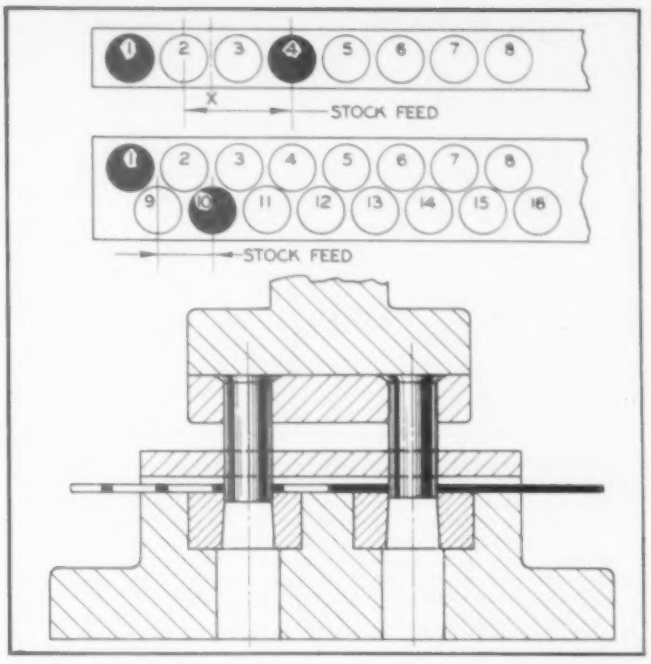
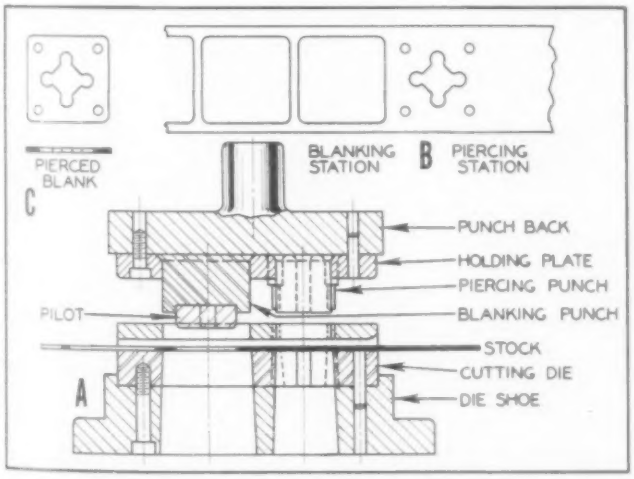


Fig. 131, showing—at bottom—a typical multiple cutting tool. The die openings are spaced to suit the stock layout, two examples of which are shown at top and center. For the first cut, the leading edge of the stock would be fed into the stock guide up to a feed stop. For layout A, blanks Nos. 1 and 4—shown sectioned—would be cut. The stock would then be moved the stock feed distance indicated and blanks Nos. 3 and 6 would be cut. The next stroke would cut 5 and 8, and so on, thus cutting every blank opening except No. 2. In order to cut No. 2, a station stop located at X, and used for a first cut of one hole only, would be necessary. With small blanks cut from coil stock, this "lost hole" is often ignored. But, if the blanks are substantial in size, or if the stock is in the form of short strips, an effort is made to cut every blank space.
A more economical arrangement for a circular blank is shown at B. The first stroke of the press would cut blanks 1 and 10, the next stroke 2 and 11 and so on. With this arrangement, a single tool could also be used by passing the stock through the tool twice. The first pass would cut blanks 1, 2, 3, and so on, one at a time. The stock would then be reversed and blanks Nos. 9, 11 and so on would be cut. However, the procedure should only be used when the stock is of substantial thickness, so that the resultant scrap frame from the first pass will be sturdy enough to stay straight and not kink or break when given the second pass.

Choice of Tool

The type of tool to use for any particular cutting operation will depend largely on the design of the product, quantity and quality requirements, size of the work and allowable tool expense. In many instances, combinations of the four types of tools discussed may be necessary in order to satisfy the requirements. For example, a progressive tool piercing and blanking one piece per stroke may have to be arranged in multiple to satisfy high production requirements. On the other hand, two simple and cheap tools, requiring two operations per piece, may be necessary on a small-lot run in order



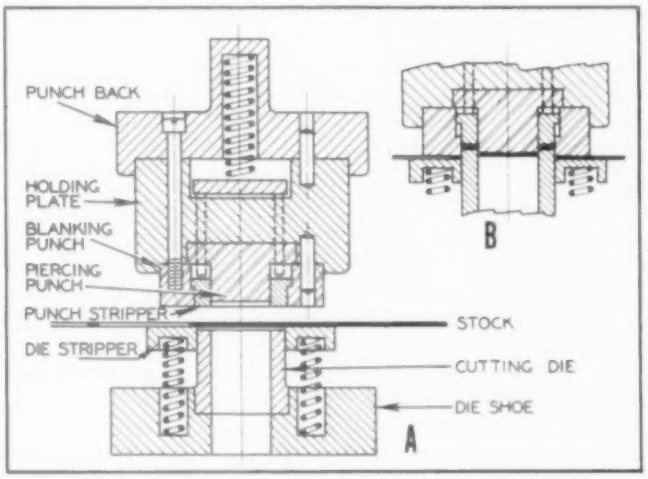


Fig. 132, at left, illustrates—at A—a progressive tool for producing the pierced blank shown at B. At the first station, the four outer holes and the center hole are cut out and the stock then moved to station 2. The feed stop will spot the pierced area over the blanking station, and as the blanking punch moves down the pilots fitted to it will pick up the pierced holes and insure correct relation between the holes and the blanked edge. Simultaneously, as the pierced blank is being cut out, the piercing punches at station 1 are piercing holes in the stock located there. The scrap frame is shown at B. Fig. 133, at right, shows a typical compound cutting tools. During the cutting cycle, the stock is held flat between the faces of the punch stripper and the cutting die, and the work is pierced and blanked at the one station without being moved. Compound tools are usually used on presses equipped with roll feeds. In operation, the scrap frame is carried below the cutting edge of the cutting die, as shown at B, and brought back slightly above the die level by the lower stripper.

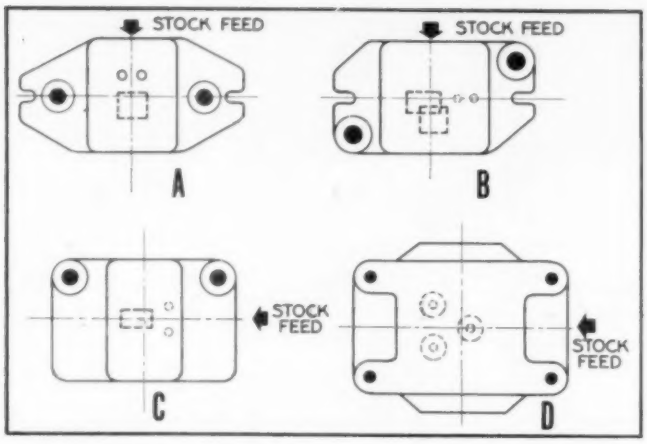


Fig. 134, showing four typical guide pin arrangements. Designs at A and B provide good guiding because a center line running through the two pins also runs through the center of the load. The design at A is suitable for front-to-back feeding, and the one at B either front-to back or right-to-left feeding. Should feed be left to right, the pins on design B should be on the opposite corners, for reasons of safety, since otherwise the front pin would obscure vision. These two designs are recommended where the operation is well within the load capacity of the press.

Design C presumes a convenient pin location because the front of the die is clear of obstructing pins and bosses. While a popular arrangement, it is nevertheless a poor design, particularly on C-frame presses which have a tendency to open up under heavy loads. Arrangement D provides the maximum guiding efficiency, and this design is essential for cutting very thin stock to close limits. However, the front pins are dangerous and, for hand-fed operations, should be well guarded. However, this design is most satisfactory for roll-fed operations running at high speeds.

to keep tool cost at a minimum. The following may be considered a general guide in deciding which type of tool to design:

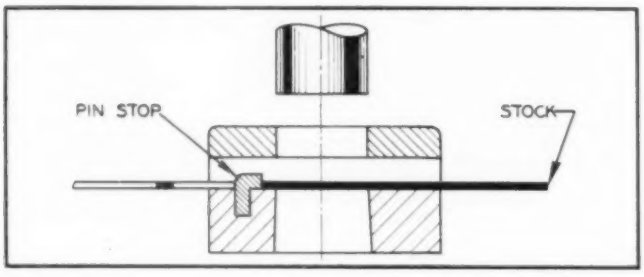
1. Simple cutting tools, used where small-lot runs are required; where minimum tool cost is essential; where the runs are large but the size of the blank would make the cost of multiple tools prohibitive; and where accuracy of size or location is not critical.

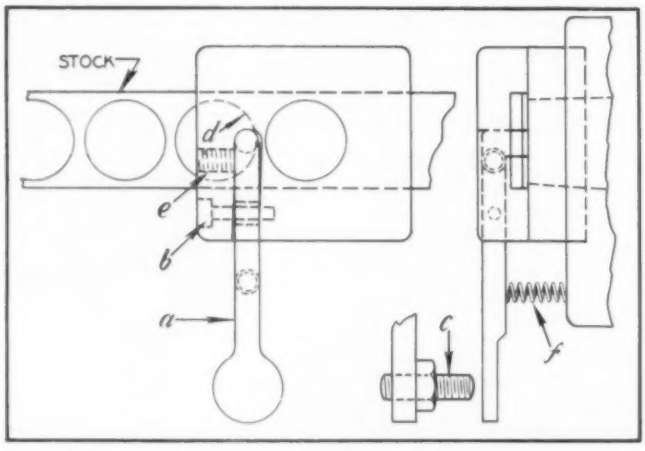
2. Multiple cutting tools, used for large lot runs where higher tool cost is permissible; and where small blanks in large quantities are required at minimum labor cost.

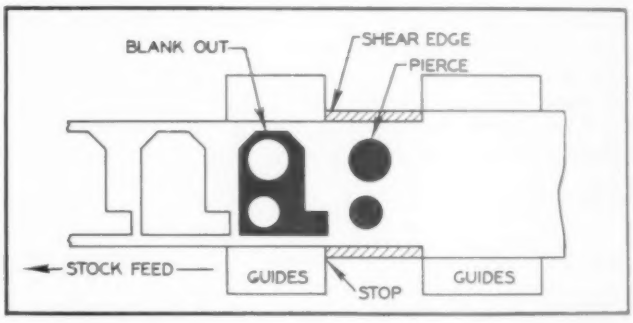
3. Progressive cutting tools, used where more than one operation is necessary on a component which must be produced at minimum cost; where higher tool cost is permissible and accuracy of hole location on the blank is not too critical; where the size is not too large to involve either prohibitive die size and cost, or awkward stock handling problems; and where the number of stations can be arranged into a well proportioned tool.

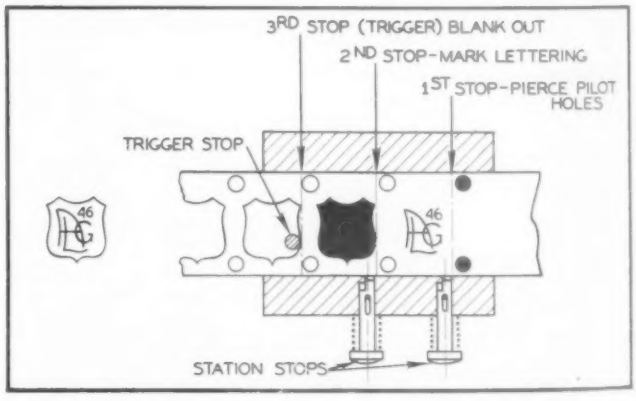
4. Compound cutting tools, used where accuracy is critical; where higher die cost is permissible; and where the press can be run continuously with minimum stroke loss.

At best, the above listing can only be a general guide because, as previously stated, combinations of details can often be used to advantage. Each cutting problem must be solved to satisfy its own particular requirements. The sketches illustrating the various types are diagrams only and are not intended to illustrate all the details necessary for successful operation. The most important of these details, and their particular functions, are described below.









Figs. 135, 136, 137 and 138, at top left, lower left and upper and lower right, illustrate several types of feed stops. The simplest of these, shown in Fig. 135, consists of a short pin pressed into the die close to the die opening. While cheap to install, this type is also the slowest in operation. After each cut, the operator must lift the stock over the pin, feed forward and then grope to enter the blanked hole on the pin—a procedure that prohibits fast production. This type of stop should only be used on the cheapest tools used for small-lot runs.

Fig. 136 shows a "trigger" stop which is automatic in action and quite efficient when properly made. It consists of a lever, "a," pivoted on a pin "b" and moved up and down by means of an extension "c" on the punch. To function correctly, it should be free to move sideways as well as up and down. To accomplish this, the pivot hole is made substantially larger than the pivot pin. When the punch comes down, the pin on the extension presses the outer end of the lever down, thereby lifting the locating end out of the locating hole "d" in the stock. At the same time, the side spring "e" pushes the lever pin over, so that it is above the bridge between blanks. When the punch moves up, the spring "f" causes the locating end of the lever to move down onto the bridge. Then, as soon as the stock is moved forward, the pin is pushed into the next blanked hole.

Yet another type of feed stop, which is useful on thin stock, is shown in Fig. 137. Thin stock is easily distorted when pulled against a pin, and by removing a portion along the edge of the stock, as illustrated, a shoulder is provided which acts as a stop when the stock is moved up to the stock guide. Naturally, a new shoulder is cut with each stroke of the press.

Of the second type mentioned—station stops—a typical example is shown in Fig. 138. Used to locate the leading edge of each new strip in position at the various stations, these stops are sometimes designed as pull stops, sometimes as push stops, and are operated manually. They lie in the path of the metal being worked and are moved, one at a time, until the stock has been fed up to the main feed stop.

Functional Elements of Design

A cutting punch and a cutting die comprise the essential elements of any cutting tool. Some tools in everyday use consist of these elements and no more; for example, rivet hole tools as used in many structural shops consist only of a punch and a die for piercing single holes. Hole locations are often merely center-punched, the stock located under the punch by eye, and the hole pierced. However, when large quantity and fast production enter the picture, together with accuracy of size, location and similar requirements, features must be added to the tool to satisfy these requirements. The most important of these may be summarized as follows:

1. Guide pins, to maintain alignment between the stationary and the moving members of the tool; 2, strippers, to remove the stock from punches after the cut is made; 3, stock guides, to keep the stock centrally located over the die openings; and, 4, feed stops to govern the amount of stock movement between cuts.

Most of these features have an important bearing on both cost of operation and tool life. The time taken to make the actual cut is comparatively slight, and from 75 to 95 percent of the operation cycle is used up in feeding the stock and removing the work from the scrap. It therefore follows that any feature which lowers the feeding and removal time will automatically lower production cost. The features named above follow a more or less standard form and need neither be elaborate in design nor costly to make. But, design must be such that the tool is safe to operate and capable of fast production while reasonably automatic in operation. And while it is not the purpose of this discussion to go into the many aspects of cutting tool design, a brief description of the accessory features listed above should show reason for their importance.

Guide Pins, Strippers, Stock Guides and Feed Stops

The use of guide pins or posts for all but the cheapest cutting tools is strongly recommended. Their principal function is to keep the two cutting edges in alignment during the cutting cycle; thus, they maintain a uniform clearance on all parts of the periphery even when there may be some looseness in the press ram.

Guided dies are also much easier to install and, furthermore, minimize danger of shearing the cutting edges when setting the tools in the press. The saving in die life, improvement of quality of cut due to uniform clearance, and reduced setup time, are all factors which make the extra slight cost of guide pins a good investment. The pins should be securely anchored in one member and a close sliding fit in the other. The location of the guide pins is an important point in die design. They should be so located that the spreading effect, created by the punch meeting the metal being cut, does not tend to bind the pins on their bearings. Four typical pin arrangements are shown in Fig. 134.

Because of the tendency of metal being cut to grip the punch, it is necessary to equip most cutting tools with strippers. Stripping pressure may be as high as 15 percent of the cutting pressure and, unless the strippers are carefully made, the stripping action may cause some distortion around the hole. Also, if the punches are not well secured, or "anchored," there may be occasioned sufficient drag to pull them out of the holder.

Depending on design of the tool, strippers are attached to the punch or the die. When a part of the die, they are usually in the form of a combined stripper and stock guide, as shown in Fig. 129-A. When part of the punch, they are usually spring-actuated, as shown in Fig. 130-A. As suggested in a previous section, rubber plugs around the punches are sometimes quite satisfactory as strippers on cheap tools. When a shell is being side-pierced on a horn tool, and the

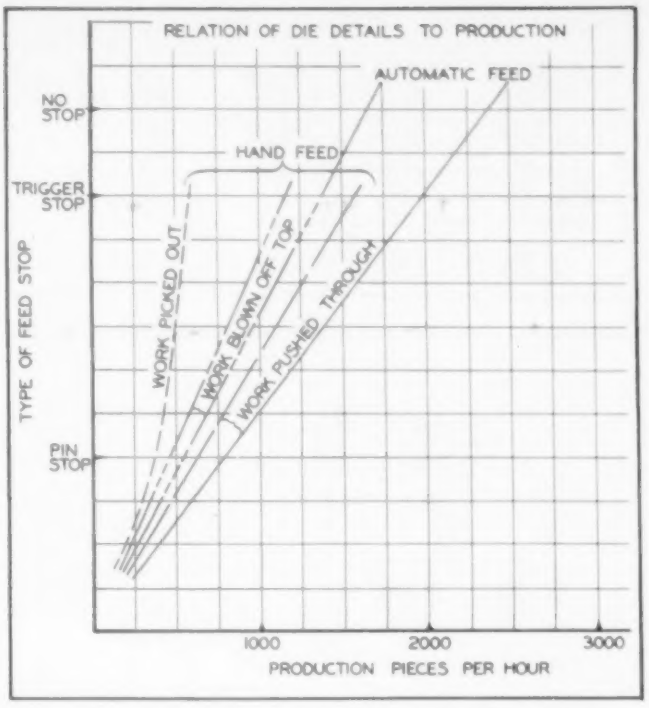


Fig. 139, a chart showing the relation of die details to production and further illustrating the importance of the details discussed in this section. Note how production is affected by the different types of feed stops, work handling and methods of removing the work from the die—as, for example, workpieces may be picket out, blown off or pushed through.

metal is sufficiently thick to withstand the pull of the punch without distortion, a stripper is unnecessary.

Another type of stripper—called a positive knockout—is operated by a knockout bar on the press, as shown in Fig. 76, Installment No. 8. In any event, the stripper should be strong enough to push the stock off the punch as it rises from the die. On spring-actuated types, the stripping plate should be thick enough to stay flat under stripping pressure. On heavy cuts, the positive strippers are preferable.

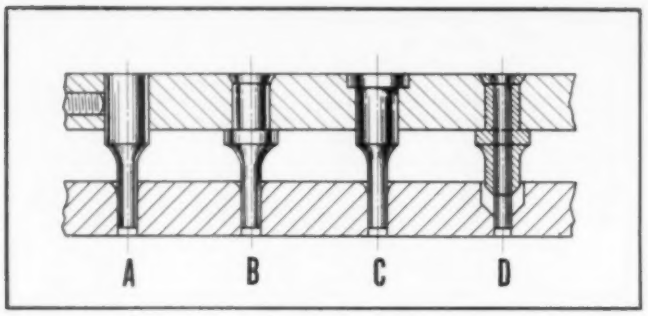
Feed stops may be divided into two kinds: 1, as stops to control the amount of feed from one cut to the next; and 2, as station stops used at the early stations on progressive tools to control the stock feed up to the point where the main feed stop comes into play. Some simple blanking tools may be used without feed stops when the press is equipped with dependable roll or hitch feeds. Hand-fed tools are usually fitted with feed stops. One may choose from several designs, one of the simplest being illustrated in Fig. 135, others in Figs. 136, 137 and 138.

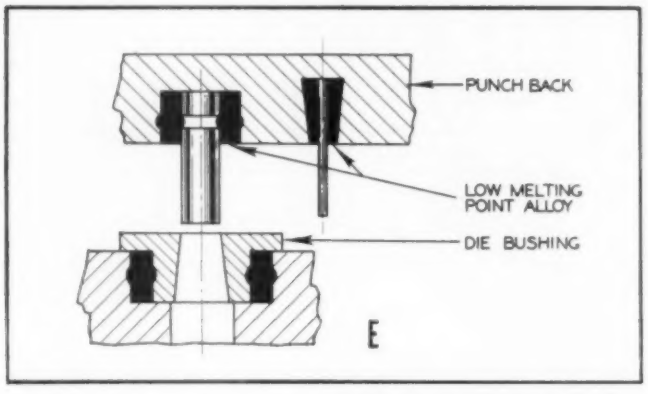
Construction Details

Even though a cutting tool may be well designed and appears to completely satisfy the various requirements of the product, it can still fail to live up to production expectation and useful die life if carelessly made. Through the years, a diemaker builds up a fund of "die sense," to say nothing of toolmaking skill, and automatically recognizes the importance of seemingly unimportant details. The effect of a few of these on production may be assumed from Fig. 139.

The diemaker knows that high quality of workmanship in every step of building the tool, plus sound, practical design, are the keynotes of trouble-free dies. All too often, designers lack a background of practical experience, and in such cases, the experience of the diemaker should be given full play. It is so much easier to erase a paper error than to correct it in steel. The following comments will stress just a few of the more important details of construction.

Punch backs. Punch holders may be made from steel, nickel, iron or common grey iron. They should be sound, and





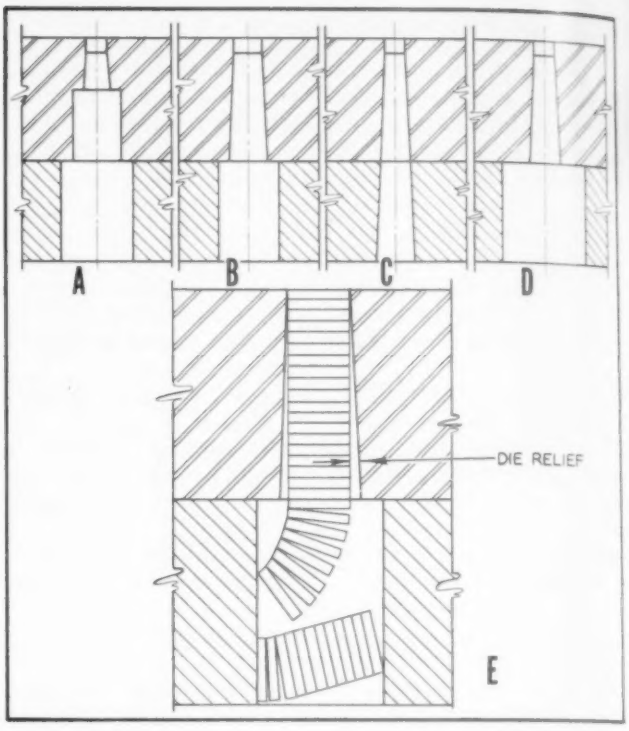


Fig. 140, at upper left, shows several methods of holding small punches in holders. The method at D is recommended for small punches, while the one at C is good for larger punches. A and B indicate poor design, A because of insecure and possibly inaccurate anchorage, and B because of the difficulty of removal in event of wear or breakage. Low melting point alloys are sometimes used to anchor punches and die bushings, as shown in Fig. 141, at lower left. This method is economical as far as die cost is concerned, but is not recommended for tools which must produce large quantities of accurate cuttings. Fig 142, at right, shows several types of die relief. A and B indicate equally poor design because they allow slugs to turn, as shown at E. The slugs will adhere to each other, due to oil and burrs, and form a "wire" which turns in the large opening and stick to the side walls. Each time a slug is pushed into the die, the lower one will jam a little tighter until, eventually, they all pack solid. When this occurs, the punch bends or breaks, necessitating its replacement in addition to having to drill out the slugs in the die. The design at C is preferable because, as the slugs cannot turn, they drop out in "sticks" ½ in. or more in length. When the taper cannot be carried right through the die shoe, the design at D may be used since, as the opening below the cutting die is large, the slug column can turn without catching on the edge of the hole.

carefully machined, so that the face which fits up to the press ram is perfectly parallel to the face on which the punches are attached. On cast iron punch backs, the shanks are sometimes inserted, preferably so on large heavy tools. The shank should be machined true with the back face of the punch back. On small tools, the clamped shank is a sufficient means of holding the punch assembly to the ram. On large tools, it is wise to use hang-up bolts or strap clamps to ensure good anchorage.

Punch holding methods. Large cutting punches are usually screwed and dowelled directly onto the punch back. Small punches for piercing may be attached to a holding plate by any of several methods, and must be accurately fitted. Inaccuracies of punch location corrected by drifting is evidence of poor toolmaking. Punches should be well backed up, and easily removed when broken. Several methods are illustrated in Figs. 140 and 141.

Sometimes, low melting point alloys are used to anchor punches and dies, and the tools for jig-saw puzzles may be cited as examples. The long, snaky punches—made from steel-rule stock—can be securely anchored by this method yet would be extremely difficult to attach by other means.

Groups of small slender punches should be backed up with hardened steel plates to prevent them packing into the softer metal of the punch back. They should also be supported as close to the cutting edge as possible, to prevent deflection and breakage, and the holding plate or plates should be securely dowelled to the punch back to prevent even the slightest deviation from correct location.

Die Shoes. Because die shoes must often bridge a large opening on the bolster plate or press bed, in order to let the blanks or slugs fall free, they should be sturdy enough to withstand the impact of cutting without deflection or failure. Inserted cutting dies should be securely dowelled in place, and kept in alignment with the punches by means of close-fitting but free-moving guide pins. Well-made die sets, consisting of a punch back and die shoe complete with guide pins, are available from a number of manufacturers specializing in that work. Die sets with frictionless guides are also available for the better-class tools.

Die relief and clearance. Cutting dies and cutting punches are the part of the tool which do the actual work, and faults in either can easily upset the quality of the cut. The clearance between the cutting edges is of vital importance, and the results of errors in clearance have been demonstrated in an earlier section.

The cutting edges of both punches and dies must be kept keen to localize the cutting forces and to keep loads to a minimum. Die-walls should be slightly tapered below the cutting edge. Known as die relief, this is intended to provide a rake for the cutting edge of the punch and to facilitate removal of the slugs. For average work, and for cuts on soft metals, this relief should start at the cutting edge.

For more accurate work, and for cutting hard metals, the die opening should be parallel for about $\frac{1}{16}$ in. or more from the cutting edge, and relieved from the lower edge of this parallel band. The amount of relief varies with the kind of tool being built. On dies for small holes, the die relief should be from $\frac{1}{4}$ to $\frac{1}{2}$ deg per side. For larger die openings, it can be up to $\frac{3}{4}$ deg per side, although die relief as high as 3 deg per side is not unusual on cheap dies for small runs.

The question of die relief brings up an important point in piercing die design—that is, the removal of slugs. Incorrect relief, both in the cutting die and in the shoe below it, will cause a jamming of slugs. More punches are broken on account of plugged dies than for any other reason. Several types of die relief are shown in Fig. 142.

The concluding installment of this series will follow in July issue, THE TOOL ENGINEER.

TOOL ENGINEERING DATA

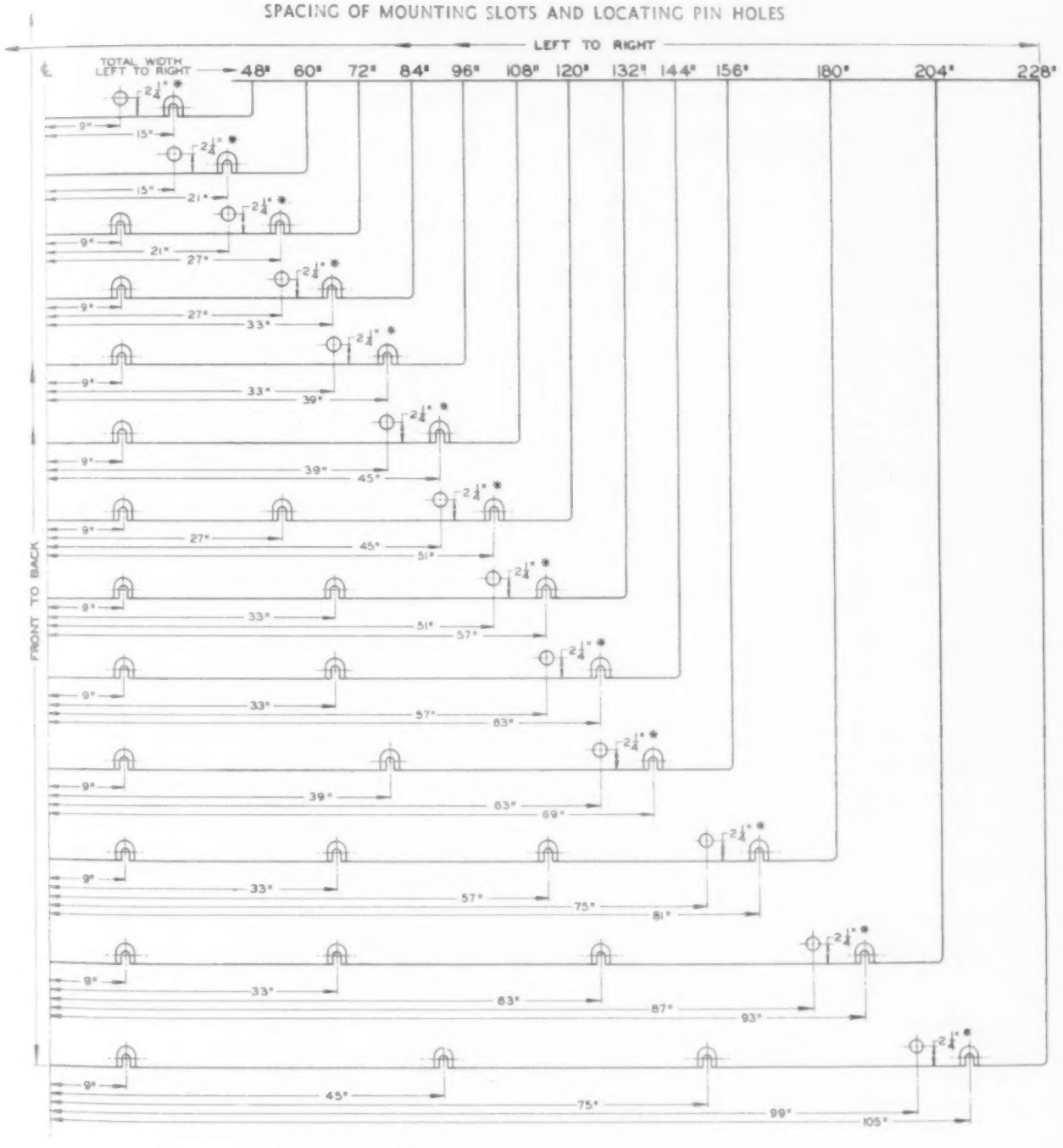
NUMBER SIX

J. I. C. Standard Press Dimensions

Single Action — Multiple Point Press

BOLSTER PLATE

SPACING OF MOUNTING SLOTS AND LOCATING PIN HOLES



* Reference dimension only—see below.

IMPORTANT: Each mounting slot is measured from the left to right and front to back centerlines of the Bolster Plate within a tolerance of ± .032.
Each locating pin hole is measured from the left to right and front to back centerlines within a tolerance of ± .015.

J. I. C. Standard Press Dimensions

Single Action — Multiple Point Press

BOLSTER PLATE

THICKNESS, TOTAL DEPTH (FRONT TO BACK) AND TOTAL ROWS OF PRESSURE PINS (FRONT TO BACK) IN RELATION TO CAPACITY OF PRESS

Capacity of Press in Tons	Bolster Plate		
	Thickness of Bolster Plate	Total Depth Front to Back	Total Rows of Pressure Pin Holes Front to Back
50	3½	30	4
75	4	30, 36	4
100	4½	30, 36	4
100	4½	42	6
100	4½	42	4†
125	5	30, 36	4
125	5	42	6
125	5	42	4†
150	5½	36, 42	4
150	5½	48	6
200	6	36, 42	4
200	6	48, 54	6
250	6½	42	4
250	6½	48, 54	6
250	7	60, 66	8
300	7	48, 54	6
300	7	60	8
300	7½	66	8
300	7½	72	10
400	7½	54, 60	6
400	7½	66	8
400	8	72	8
400	8	78	10
500	8	54, 60	6
500	8	66	8
500	9½	72	8
500	9½	78, 84	10
500	9½	90	12
500	11½	96	12
500	11½	102, 108	14
600	8½	60	6
600	8½	66	8
600	10	72	8
600	10	78, 84	10
600	10	90	12
600	12	96	12
600	12	102, 108	14
800	9	60	6
800	9	66	8
800	10½	72	8
800	10½	78, 84	10
800	10½	90	12
800	12	96	12
800	12	102, 108	14
1000	11	72	8
1000	11	78, 94	10
1000	11	90	12
1000	12	96	12
1000	12	102, 108	14
1250	11	72	8
1250	11	78, 94	10
1250	12	90, 96	12
1250	12	102, 108	14
1600	12	84, 90	10
1600	12	96, 102	12
1600	12	108	14
2000	12	90	10
2000	12	96, 102	12
2000	12	108	14

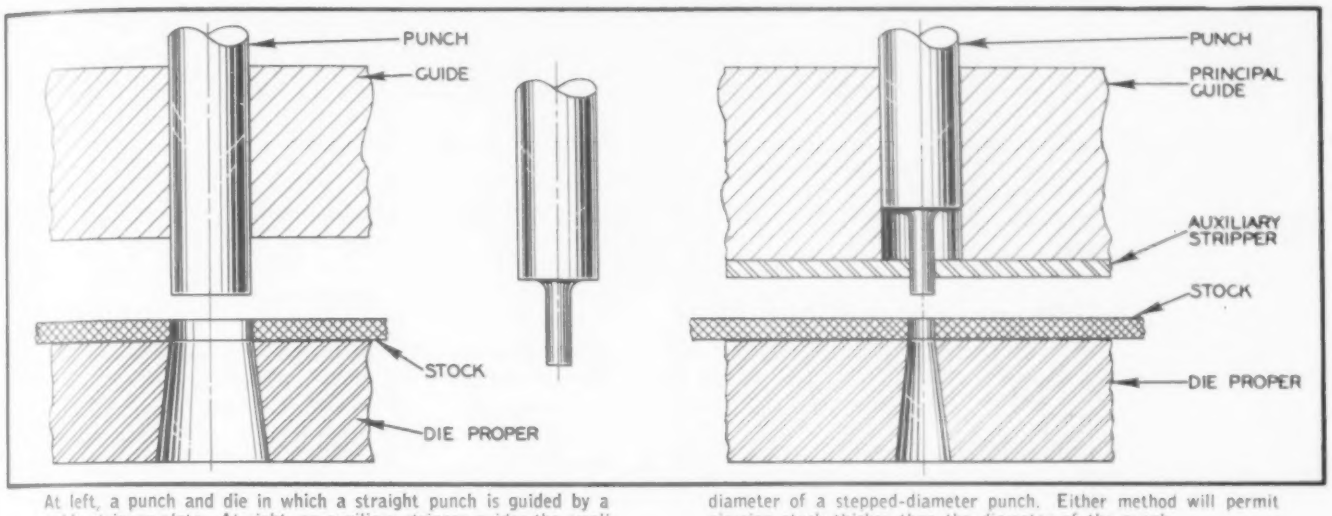
†Applies to 72 x 42 and 84 x 42 press sizes.

The above suggested standards have been adopted by the Joint Industry Conference, a group comprising representatives of press manufacturers and users, in the interests of dimensional standardization and more effective press usage.

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Punching Small Holes in Heavy Stock



At left, a punch and die in which a straight punch is guided by a guide-stripper plate. At right, an auxiliary stripper guides the small diameter of a stepped-diameter punch. Either method will permit piercing stock thicker than the diameter of the punch.

By way of preliminary explanation, there is this difference in European and American methods of die making. In America, the custom is to use die sets provided with guide pins to assure alignment between punch and die, whereas the Europeans incorporate initial alignment into the punch and die.

For example, European diemakers are inclined to provide a stripper having thickness up to 1½ times the diameter of the punch, which then has a close sliding fit in the stripper. This is shown in the illustrations. Thus, one provides a "guide" which is a stiff, rigid support for the punch which, for the majority of small holes, is made from drill rod.

This method works very nicely when it comes to piercing small holes in comparatively thick stock. Where, however, the punches have a comparatively thick body and a small cutting diameter, then an auxiliary stripper is employed. This acts as an extra guide for the small diameter, as shown in the illustration at right. In either case, the punch is adequately supported close to the die—or to the top surface of the stock—and thus prevents the side-play which would throw the punch out of alignment and cause breakage.

Another consideration, here, is the matter of clearance. It has been established that the cutting pressure, in die work, is always less with increasing clearance between the punch and the die opening. Therefore, when punching small-diameter holes which are less than the stock thickness, one must increase the clearance in order to decrease the compression stress upon the slender cutting points of the punch.

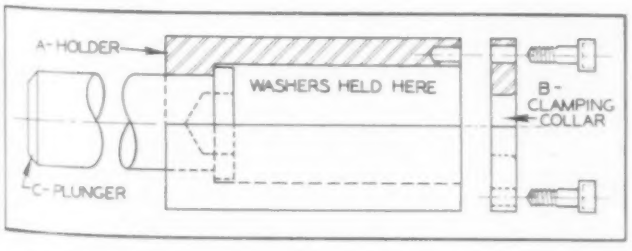
It is also essential that the guides be at exact right angles to the center line of the punches; otherwise, there will be imposed an oblique cutting angle, subjecting the punch to bending strains and possible breakage. If properly made and aligned, however, dies made as shown will permit production punching of stock considerably thicker than the diameter of the punches.

Federico Strasser
Santiago de Chile

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 for each item.

Holder for Reboring Washers

To speed a rush job calling for reboring several hundred 1½x⅝ in. washers to 57/64 in. I.D., the writer made a holder as shown. The inside of the shell "A" was bored to suit the O.D. of the washers, and of a length just short for a given number of washers.



The holder shown permits a number of washers to be rebored in the one pass.

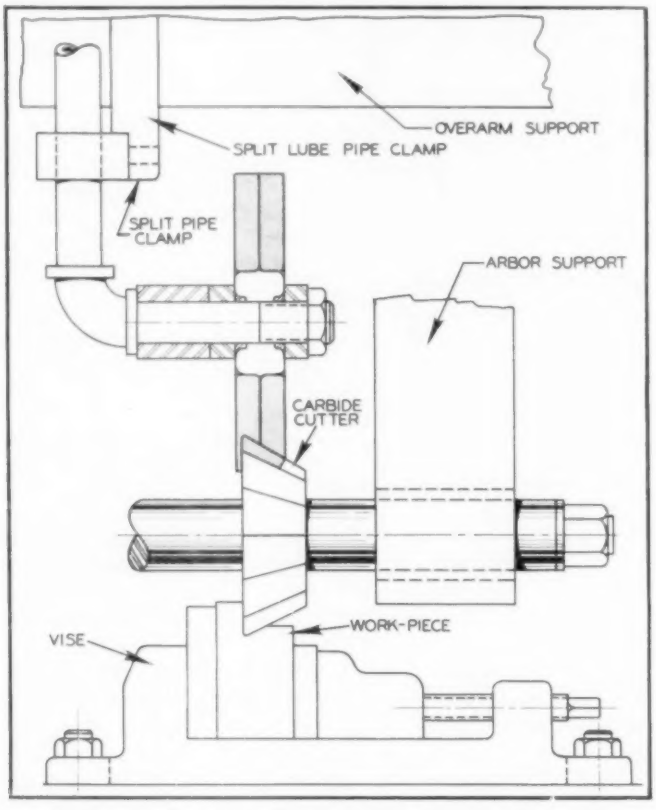
A clamping plate, "B," was bored 57/64 in., and served also as a drill bushing. A plunger, C, was made slip fit in the holder and partly drilled 57/64 in. diameter. The shank end was held in a universal chuck, although a spring collet would have served better.

To operate, a number of washers were loaded into the shell, and clamped with the plate. This made the entire assembly solid. The loading of washers was drilled in one pass, and the hold in the plunger held burrs on the end piece to a minimum. When all washers in the loading had been drilled, the plate was unclamped and the washers ejected by the plunger. The end plate was hardened to resist wear from the drill.

O. W. Anderson
Minneapolis Chapter, ASTE

Chip Wiper for Carbide Cutters

Oftentimes, an air blast fails to remove a sticky type of chip from carbide cutters. The chip wiper shown, which may be adapted to a horizontal milling machine and serves to keep cutters clean, is mounted on the lubricant pipe and held by a split clamp. The brushes, which are adjusted to suit, do not rotate. After a spot is worn on the brush, it may be loosened and turned slightly to present a new wiping surface.



A brush, mounted as shown, clears chips from carbide milling cutters.

The device illustrated has been used extensively and has worked satisfactorily, without harm to cutters. The same device may be used for a face mulling type of cutter although, in such case, the brush would have to be relocated in a different plane.

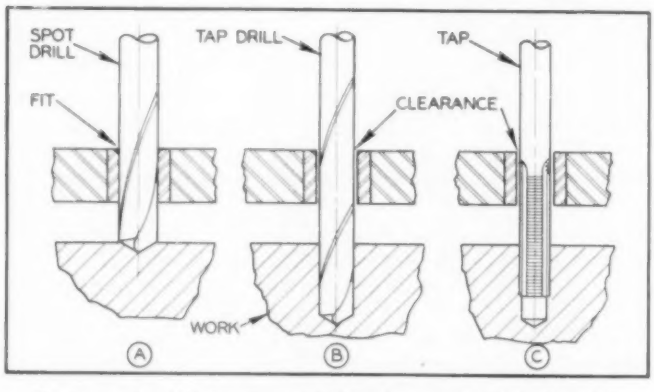
A. S. Childs, Tool Supervisor
Jones & Lamson Machine Co.
Springfield, Vt.

Drill and Tap Through One Bushing

While the idea is old to the veterans, it may be new to beginners learning the ropes. When drilling and tapping in the one fixture, the usual procedure is to first drill and then tap, using a slip bushing to guide the drill. The slip bushing is removed for the tapping operation.

However, a pressed-in bushing may be used, of a size that will suit the tap. In such case, the hole is first spotted with a full-size drill, then followed by a tap drill and finally by the tap through the same bushing. The method shown is a time saver when using a 3-spindle gang drill as the work-holding fixture needs merely to be moved from spindle to spindle.

Stanley R. Welling
Racine, Wis.

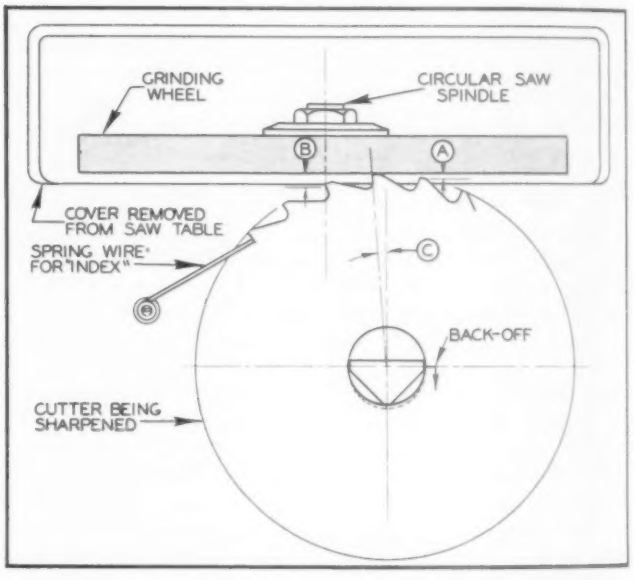


Parts may be drilled and tapped through a pressed-in bushing by first spot drilling with a body-sized drill.

Simple Cutter Grinder

For the home mechanic, or the small shop lacking a regular cutter grinder, an improvisation can be made by using a plain wood cutting table saw. Install a grinding wheel in place of the saw, leaving the removable plate out of its recess in the table top. Square up the table with the wheel to insure a square grind.

Next, make a plate and provide a triangular stub whose major diameter is slightly less than the hole in the cutter, and fasten this to the table. The plate can be made from thin plywood and the stub from a piece of hardwood. A piece of thin spring wire, or a length of thin clock spring, will serve as an "index," tooth for tooth.



A setup as shown permits cutter grinding to be done on a circular saw table.

In setting up, lay the cutter flat on the table and touch the stationary grinding wheel, bringing a land flat against the wheel and visually gaging the relative differences between points "A" and "B." Then set the spring index against one of the teeth, as shown.

By moving the cutter in against the wheel until the hole bears against the apex of the triangular stub, the grinding of each tooth can be closely duplicated.

To index, merely move the cutter away from the wheel, clearance being permitted by the relief on the stub. Index over to the next tooth and repeat. The plate can be retained as set, for regrinding the same cutter, or different cutters may be ground by locating the plate in the table to suit each cutter being ground. With reasonable care, a very creditable job of cutter grinding can be done with this simple setup.

Arthur R. Christensen
ASTE Member, Lockport, N.Y.

Montreal Plans Lavish Hospitality For October Convention

Unveiling of New Process to Highlight Technical Program at Canadian Meeting Schedule Includes Short-Run Plant Operations, Laurentian Trip, Social Events

ASTE MEMBERS can circle October 27, 28 and 29 on their calendars as a red-letter weekend. At least it will be for those who accept Montreal chapter's invitation to the Society's 17th semi-annual meeting there at Mount Royal Hotel.

It will be a red-letter occasion for industry, too. For a brand new method of surface measuring will be taken out of its laboratory wraps during the convention.

But this is only one of the attractions which the host group and the National Program Committee lined up in a meeting, April 22 and 23, at Canada's island metropolis. F. J. Schmitt of Chicago, national program chairman, presided at the two-day planning session.

Thursday morning when the convention opens, the committee decided, the Montrealers will show their town and its environs in a two-hour program of scenic films. This will help the visitors to orient themselves and determine what they'd like most to see and do.

At noon local industrialists will be introduced to the out-of-town tool engineers at an executives' luncheon in the Normandie Roof of the Mount Royal. Mayor Camillien Houde and one of the city's top management executives are scheduled to address the function.

A nine-session technical program, featuring "Economical Tooling for Short Run Production," begins Thursday afternoon. John Houghton of Northern Electric Co. will chairman a symposium on "Die and Mold Hobbing." The first speaker will deal with "Design, Materials and Methods" and the second, "Finishing After Hobbing."

A concurrent meeting will be devoted to the "Application of Standardized Tooling to Cut Costs."

Every tool engineer who possibly can will crowd into the evening session for the premiere of "A New Concept in Surface Measurement." General Motors speakers will present two papers and a Chrysler Corp. representative will discuss a third phase, in the first, detailed public presentation of the sensational new process these companies individually are developing. This ASTE scoop alone will make the trip to Montreal worthwhile.

G. A. Rogers of Rudel Machinery Co., Montreal representative of the ASTE National Program Committee, will conduct the session.

Friday morning a lecturer on "Reduction of Die Costs Through the Use of Low Melting Point Alloys" will be presented by A. B. Chevrier of Upton-Bradeen & James, Ltd. Samuel Pedvis of the same company will preside during a discussion of "Special Purpose Machines from Standard Units."

The afternoon double-header includes a symposium, "Estimating for Low Cost Production," and a paper dealing with "Low Cost Tooling for Sheet Metal Products." J. M. Rudel, president of Rudel Machinery Co., Ltd., and John M. Bishop of Accessories Manufacturers, Ltd., are the respective chairmen.

In the evening James O. Horne of James O. Horne Co., Rochester, N. Y., a member of the National Program Committee, will present a speaker on "Tap Research."

Final topic, Saturday morning, is "Statistical Quality Control" with T. J. Tracey of Canadian General Electric Co. as chairman.

Practical applications of short run tooling techniques will be demonstrated during tours of plants whose products range from radios to aircraft and locomotives.

Already arranged are visits to Dominion Engineering and Machine Co., the Wire and Cable and Telephone Divs. of Northern Electric Co., Ltd., Montreal Locomotive Co., Canadian Vickers, Ltd., Radio Corp. of America, Canadair, Ltd., Canadian Pacific Railroad Co. and three plants of Canadian Car & Foundry Co.

As dessert for this substantial repast of technical fare, there will be an all-day trip Saturday through the Laurentian Mountains.

After lunching at a resort hotel, the party will return to Montreal in time for the banquet, when a Canadian trade and commerce official is expected to address the Society.

Host committeemen are also working out a schedule of special plant tours,

President R. B. Douglas feeds the little white pig at Au Lutin qui Bouffe during National Program Committee dinner at Montreal. From left around table: G. A. Rogers, H. M. Windsor, F. J. Schmitt, J. O. Horne, Gardner Young and Mr. Douglas. In former days a little porker tore around the dining room pursued by a chef with a threatening meat cleaver. This is one of the interesting restaurants ASTE'ers will frequent at fall meeting in Canada

sightseeing, a fashion show, and other events of interest to women visitors.

Attendance at the April organization meeting included: President R. B. Douglas of Montreal, G. A. Rogers of Montreal, first vice-chairman, Gardner Young, of Pittsburgh, second vice-chairman, and J. O. Horne of Rochester, N. Y., secretary of the National Program Committee.

Chapter officers and convention committeemen present were: M. A. Cote, chapter chairman; M. G. Baker, second vice-chairman; J. P. Cloutier, third vice-chairman; Charles Gareau, secretary; M. J. McDowell, treasurer; H. T. Welch, convention meetings and arrangements chairman; T. C. Hill, plant tour chairman; W. F. Stewart, transportation chairman; J. P. Harkness, registration chairman; A. B. Chevrier, banquet chairman; and J. M. Masse. H. M. Windsor, secretary to the National Program Committee, represented the national office.

Swigert Heads Joint Standards Project

Detroit, Mich.—A. M. Swigert, vice-president in charge of manufacturing, Universal Products Co., Dearborn, Mich., has been appointed chairman of the ASA Sectional Committee B52—Classification of Materials for Tools, Fixtures, and Gages, L. B. Bellamy, ASTE national standards chairman, has announced.

In making this appointment to the ASTE-sponsored standardization project, Mr. Bellamy states that Mr. Swigert is exceptionally well qualified for the assignment.

He is well known in engineering circles as the author of "The Study of Superfinish," written while he was director of production research for the Chrysler Div.

A. M. Swigert

O. E. Harvey

of Chrysler Corp., and published in 1940 by Lynn Publishing Co. Many eastern chapters of ASTE have heard him lecture on this subject.

During the war years Mr. Swigert was master mechanic at the Chrysler Corp. Tank Arsenal near Detroit and works manager for the Ingalls Shipbuilding Corp. at Pascagoula, Miss. For the past 11 years he has been a member of ASTE.

Mr. Bellamy has announced also the appointment of O. E. Harvey of Cleveland, Ohio, to the ASTE National Standards Committee.

A member of the Data Sheet Sub-Committee of the Standards Committee, Mr. Harvey has long been active in the field of standardization.

He is associated with the Modern Corp., Detroit, as a sales and service engineer.

Taking the oath of office at Rockford are from left: Ernst Norrman, secretary; Bruce Lundgren, treasurer; Harry Carlberg, third vice-chairman; George Torrence, second vice-chairman; George Rigeman, first vice-chairman; and Karl Kaiser, chairman. George Johnson (back to camera), former vice-president, is conducting the installation ceremony

Kaiser Takes Office at Rockford Installation Night

Rockford, Ill.—Rockford chapter held its installation night, April 6, at the University Club building.

Howard Nelson, retiring chairman, opened the meeting with a brief resume of his administration, then asked George C. Johnson, former vice-president, to install the following officers: Karl B. Kaiser, chairman; George Rigeman, first vice-chairman; George Torrence, second vice-chairman; Harry G. Carlberg, third vice-chairman; Bruce Lundgren, treasurer, and Ernst Norrman, secretary.

After swearing in the new executives Mr. Johnson presented a past chairman pin to Mr. Nelson.

Chairman Kaiser began his term by reporting on the house of delegates meeting at Pittsburgh.

Three Allegheny Ludlum films were shown. The first, "Melting and Refining of Modern Steels," portrayed operations involved in the six to eight hour process of making stainless steel. From the introduction of raw stock to the electric furnaces until its expulsion as ingots, steel making is an exacting procedure requiring frequent testing.

In "Exploring with the Microtimer," the members saw through the lens of a high speed camera what goes on when a cutting tool is used at the wrong surface speed and feed, as contrasted with correct conditions. In machining stainless steels at too fast a surface speed, a hopping condition develops, the film revealed.

The third film, "Legend of Useppa," was non-technical. It depicted a typical day of angling for tarpon and other deep sea fish in the Gulf of Mexico near the Florida Keys.

After the showing of the two steel films, Leroy Gippert, Allegheny Ludlum Steel Co. representative, answered questions from the floor.

Prior to the program a smorgasbord dinner was served to the 100 members attending the meeting.

Other News in This Issue

* * *

Chapter listings include member as well as meeting news.

Metal Spinning Authority Lauds Canadian Machines

St. Catharines, Ont.—"Canadian-made spinning machines rank high with the best in the world," said J. W. Lengbridge of Aluminum Company of Canada, Toronto, while addressing Niagara District chapter at a meeting at Hotel Queensway, April 7. Guests from Hamilton, Ont., Niagara Falls, N. Y., Detroit and Toledo were present to hear Mr. Lengbridge discuss "Spinning Aluminum."

He began by tracing the development and growth of metal spinning from its introduction into this country some 100 years ago for the manufacture of art objects. Now, with modern machinery, the process is used to produce shells, milk churns, aero engine cowlings and an infinite variety of sheet metal products.

"Spinning is a highly skilled craft," the speaker commented, "since the craftsman must learn to feel the flow of the revolving material as it follows the shape of the form under pressure of his hand tool. Such skill takes years of experience to perfect."

Semi-automatic and fully mechanical spinning machines, described by Mr. Lengbridge, require less skill to operate. Aluminum alloys he finds easiest to spin are 2SO and 3SO. Magnesium, he added, also can be spun, but it must be done hot, increasing manufacturing costs.

The audience was amused by a slide illustration of a machine used in India. The worker was seated, leaving his feet free to act as a tailstock or pressure pad. Pointing to an oil pot in the picture, Mr. Lengbridge explained that the man used it to cool and lubricate his foot.

Herbert L. Tigges, Society vice-president and guest of honor, briefly outlined steps that the U. S. National Securities Resources Board is taking to assure adequate supplies of machine tools in the event of a national emergency.

Mr. Tigges urged tool engineers to be alert to develop new processes and operations to keep Canada and the United States ahead of the world in the mass production field, and so improve our standards of living.

Rhodehamel Addresses Past Chairman Event

Seattle, Wash.—Forty-two members and guests of Seattle chapter attended the annual past chairmen's night, April 22, which was climaxed by a discussion on screw machines. R. R. Rhodehamel of the National Acme Co., Cleveland, Ohio, was the speaker.

Slides augmenting Mr. Rhodehamel's talk showed typical screw machine setups and the general operation of his company's bar and chucking machines. The speaker explained ingenious tooling methods lending versatility to the screw machine.

New chapter executives recently installed are: H. R. Pinkerton, chairman; James C. Smith, first vice-chairman; F. L. Coenan, second vice-chairman; C. A. Dreiling, secretary; Bruce Stewart, treasurer; and Clyde Peterson, delegate.

'Tool Engineers' Handbook Praised by Authorities

Detroit, Mich.—In another six weeks early buyers can begin poring over the first edition of the Society's "Tool Engineers' Handbook." This text "will fill a long-felt want among the fraternity of tool engineers," in the opinion of Dr. John J. Caton, founder and retired director of the Chrysler Institute of Engineering and a member of the Handbook Manuscript Review Committee. Dr. Caton is also one of the four honorary members of ASTE.

"I have perused much of the material contained in this handbook," says Dr. Caton, "and I am amazed at the wealth of information that it will place at the disposal of the 'man who needs it most.' . . . Its publication and distribution will certainly bring to the executives of every manufacturing plant in the United States and Canada a better realization of what the tool engineer really means to industry."

The distinguished educator's remarks are typical of the flood of enthusiastic comments received by Frank W. Wilson, handbook editor, from his hundreds of authors and reviewers. Although it means considerable personal sacrifice in time and effort, most of these contributors express willingness to serve again when the manual is revised.

By ordering the Handbook through the Society, members will save $4 on one personal copy. Price to ASTE'ers is $11; at retail the book is $15. Unless delayed by the bookbinders' traditional July vacation period, the publisher promises to have the Handbook on the market late next month.

Full information about the Society's newest contribution to industry will appear in the July issue of *ASTE News*.

Executives Invited to New Jersey 'Edison Night'

Annual executives night at Northern New Jersey chapter honored Thomas A. Edison, Inc., an area industry. Charles Edison, company president, formerly governor of New Jersey and secretary of the Navy, introduced Admiral Charles E. Rosendahl, who discussed "Lighter than Air Transportation." Top, from left: Mr. Edison, Admiral Rosendahl, Charles Carlson, immediate past chairman; and I. F. Holland, who recently retired from Society presidency. Below: New officers were installed at the meeting. From left: T. J. Donovan, Jr., national director and guest at the affair; Frank Sheely, alternate; Arthur Wotowicz, treasurer; John Eppecht, chairman; H. W. Ryno, secretary; A. J. Schmidt, first vice-chairman; and Charles Carlson, delegate. James Allen, second vice-chairman, is not in photo

Fire in Brazil Destroys Lahr's Technical Library

Sao Paulo, Braz.—When flames consumed the offices of Panambra S. A. here recently, ASTE'er E. J. Lahr, technical manager, lost his private library of reference books, catalogs and technical literature.

Any replacement material that fellow members can contribute will be appreciated, Mr. Lahr says in a letter to *The Tool Engineer*.

The disaster, he comments, reminds him of wartime "blitz" days in England before he joined the South American importing and exporting firm.

Technical data may be addressed to Mr. Lahr at Panambra S. A., Avenia a Senador Queiroz, 96, Sao Paulo, Brazil.

Cope Details Die Design

Fort Wayne, Ind.—Speaking before 150 members of Fort Wayne chapter, at a meeting held April 13, Stanley R. Cope, president of Acme School of Design in South Bend, discussed "Deep Draw Die Engineering."

His talk, both humorous and instructive, was supplemented with slides of die designs, graphs and formulas. Mr. Cope has been instrumental in effecting considerable standardization in the field of die design and tool engineering in general.

Before the technical session J. Wilbur Haley, principal of Central High School, gave a coffee talk, "New Trends in Education." His remarks concerned expansion of the public school system.

Cannon Compares Presses For Deep Draw Work

St. Louis, Mo.—More than 160 members of St. Louis chapter met April 7 at the DeSoto Hotel to hear Earl Cannon, manager of the Hydraulic Div., Clearing Machine Corp., Chicago, Ill., discuss design of hydraulic double action presses for deep draw work. The speaker also showed the application of each design, its merits and limitations.

In his talk Mr. Cannon compared hydraulic and mechanical presses and their tonnages for identical application. For the blank holding slide on a double action hydraulic press, he recommended a tonnage of two-thirds to three-fourths the rated tonnage of the punch holder slide.

Distinct advantages, he pointed out, can be gained by having separate pumps for the punch holder and blank holding slides. The slide-within-a-slide construction he considers most desirable since it enables die setters to concentrate the full rated tonnage of the blank holding slide at any point. This is impossible when tonnage is split among four blank holding cylinders.

American Airlines showed a color-film entitled "Wings to Viking Land."

Pneumatic Power Program Presented at Evansville

Evansville, Ind. — J. James Mudd, Midwest regional sales manager for the Bellows Co. of Akron, Ohio, explained and demonstrated "Controlled Air Power in Industry" for approximately 55 members of Evansville chapter. The program was presented at a meeting, April 11, in the Science and Engineering Building of Evansville College.

After an introductory talk on the merits of air powered devices, Mr. Mudd projected a sound film showing industrial applications.

At the close of the meeting a display of pneumatic devices was inspected by the members.

J. W. Head, field engineer in charge of the Bellows Indianapolis office, also was a guest at the meeting.

Represents Illinois Tool

Detroit, Mich.—Edward D. Wiard of Detroit Chapter, ASTE, has been appointed Detroit area representative by the Illinois Tool Works.

Mr. Wiard is also a member of the Engineering Society of Detroit and of ASM.

Top: New officers at Evansville chapter are, from left: Clyde Yost, delegate and outgoing chairman; W. V. Stippler, first vice-chairman; C. H. Thuman, second vice-chairman; W. P. Schneider, chairman; P. L. Wetzel, treasurer; and Roman Wannemuehler, secretary. Center: A. K. Phillippi of Westinghouse Electric Corp. gives details of Controlled Atmosphere Furnace Brazing in lecture before Boston chapter. At right of Mr. Phillippi are: A. J. Leone, first vice-chairman; J. P. Crosby, chairman; F. H. Leonard, education chairman; W. B. Wells, treasurer; and E. A. Erickson, editorial chairman. Bottom: J. J. Mudd, midwest regional sales manager of The Bellows Co., shows air motor to Evansville officers after discussion of air powered devices. From left: J. W. Head, Indianapolis representative of The Bellows Co., Mr. Mudd, R. W. Ackerman, program chairman, and Vice-Chairman Stippler

Tolerances, Metal Flow Stressed in Brazing Talk

Boston, Mass.—"Controlled Atmosphere Furnace Brazing—Its Principles and Practice," was informatively discussed by Arthur K. Phillippi, manufacturing engineer, Westinghouse Electric Corp., at a meeting of Boston chapter, held April 14 at the New England Mutual Hall.

Before a group of 160 members and guests, Mr. Phillippi reviewed the developments of controlled atmosphere furnace brazing for the past 14 years. His talk was well illustrated with slides showing types of furnaces used and brazing applications.

One high point in the lecture was an illustration of capillary action, the basic principle of the flow of metal between joints to be brazed.

The speaker also explained preparation of the work for brazing, along with tolerance requirements for silver and copper brazing. He recommended an average clearance of 0.0015 in. between parts to be silver brazed. Copper brazed parts, he stated, require an average interference fit of 0.002 in. for the proper flow of copper.

Mr. Phillippi displayed brazed assemblies made of steel, brass, copper, and aluminum. He drew a large number of questions from an enthusiastic audience.

An interesting film depicting the atom bomb test at Bikini rounded out one of the most entertaining and instructive meetings of the season.

Mohawk Valley Sponsors Cutting Oil Program

Utica, N. Y.—Approximately 75 members and guests heard W. L. Allman, lubrication engineer, Socony Vacuum Oil Co., talk on coolants and cutting oils at the April 26 technical meeting of Mohawk Valley chapter. The session was held in the New York State Institute's Technical Division. E. J. Masucci, chapter chairman, presided and introduced the speaker.

Mr. Allman began by stressing benefits of cutting oils; increased tool life, superior machining finishes, cooler operation, and economy through reuse.

After reviewing the history of cutting fluids from 1883, he named oils now available including pure and sulphurized mineral oil, chlorinated and sulphur chlorinated fatty oils, and sulphur chlorinated compounds.

A film, "Laboratory Technique," illustrated methods for testing coolants. By checking an instrument dial indicating when the fuse point is reached, weld build-up on tools can be determined.

Mr. Allman told the group the essential characteristics of cutting oils, such as resistance to extreme pressure, maximum cooling quality, and stability. Sulphur is added to furnish proper anti-weld, while chlorine gives lubricity.

After the talk, there was a short question and answer period.

K. C. Gives Dinner Dance

Annual dinner dance at Kansas City chapter is attended by approximately 260 members and women guests. New officers were installed as reported in the May issue

Fine Surface Finishing Supplements Grinding

Montreal, Que.—Robert H. Presnall of the Gisholt Machine Co., Madison, Wis., appeared before Montreal chapter, April 14, to lecture on "Wear and Surface Finish."

With modern machines, Mr. Presnall pointed out, moving parts operate at high speeds, and frequently grinding alone cannot produce a surface finish fine enough to do a satisfactory job. In these cases, Superfinishing is applied to obtain finishes down to two or three micro-inches.

Superfinishing, the speaker explained, is not meant to replace grinding, but supplements it, as a good commercial ground finish averages only about 30 micro-inches. For this process the stone is dressed to the contour of the work and usually is applied with a pressure of about 30 lb psi.

The work revolves between centers and the stone has a 3/16 in. oscillating movement to prevent high spots on the work from wearing a groove in the stone. Attachments make any lathe adaptable to this work. Complete machines also are available. There is no possibility of generating frictional heat to spoil the surface as low speeds of about 80 sfpm are used.

Through Superfinishing of such moving parts as crankshafts and wrist pins, breaking-in time for automobiles has been greatly reduced, Mr. Presnall indicated.

C. A. Gareau introduced the speaker and T. J. Tracey thanked him.

R. B. Douglas, newly-elected Society president, conveyed his appreciation for the gift presented him at the Pittsburgh convention by Canadian members.

Ordnance Inventor Shows Magnetic Auto Clutch

Washington, D. C.—"Gadgeteering" was the technical subject at a meeting of Potomac chapter, held April 7.

Joseph Rabinow, chief of the ordnance mechanics section of the Bureau of Standards Ordnance Development Laboratory, was the principal speaker. His account of personal experiences in obtaining patents and in the field of inventions held the interest of the engineers throughout the evening.

An entertaining feature of his talk was a demonstration of one of his own inventions, a magnetic clutch. Mounted in a model car, the clutch showed the wide range of holding power produced by variable current input. Energy lost in slippage is dissipated in heat. In applications where slippage is desirable, water cooling is required.

Valuable features of this clutch include gradual application of clutching power, excellent holding power, and delayed action permitting the motor to get up to speed before clutching takes effect.

Abbott Demonstrates Surface Measuring

Milwaukee, Wis.—April 15 meeting of Milwaukee chapter featured E. J. Abbott, consulting engineer for Physicist Research Laboratory, Ann Arbor, Mich. His subject was "The Profilometer in Production Engineering."

Using slide illustrations, Mr. Abbott described microinch finishes and demonstrated a Profilometer with the dial projected on the screen.

Chairman Arthur Gudert presided at the evening meeting in the Elks Club. Despite inclement weather which included snow and sleet, 75 members and guests were present.

Program Chairman Herbert Heimann introduced the speaker and announced plans for a chapter outing in June.

Atomic Structure Governs Hardness of Metals

New York City—If an atom were two miles in diameter, the nucleus would be the size of a tennis ball and the electrons as small as hickory nuts.

Edward V. Crane, chief engineer of the Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, made this comparison in explaining the atomic structure of metals to more than 200 members of Greater New York chapter. Mr. Crane lectured on "Plastic Flow of Metal" in a meeting held April 4 at Hotel New Yorker.

Uniform metal, he continued, has only one atom to a molecule. Atom arrangement in the crystal of pure iron provides slippage planes and low resistance to work performed on it, so this metal is considered soft.

Carbon Steel Has Complex Structure

But in carbon steel the atomic structure is more complicated, giving less slippage plane and more resistance to processing. Therefore alloyed metals are called hard.

Plastic flow, as controlled by cold working as well as by application of heat, was illustrated with charts.

Slides showed aluminum billets being reduced in a rolling mill from 3/4 in. slabs to 3/16 in. plate, and then to desired thickness by hot rolling. At the end of the process, the metal is trimmed through slitters, sheared, and wound in coils ready for commercial use in presses.

A progressive die was pictured in the stages of piercing, blanking, shaving, and drawing of dial telephone bases. Other slides demonstrated a hydraulic job for forming aluminum beer barrels by successive draws.

The speaker also showed illustrations of the drawing of sardine cans, a 15,000 ton press for pressing out Chevrolet truck hoods, and a large press for straightening Ford axles.

Julius Schoen presided at his first meeting as chapter chairman.

Europe Misunderstands Us Says Installation Speaker

Toledo, Ohio—Annual installation dinner was held recently by Toledo chapter in the Hotel Secor ballroom. Guest speaker was Alexander G. Bryant, president of Bryant Machinery & Engineering Co. His address, "Put America Into the Recovery Program," was of vital interest to tool engineers.

Having recently returned from Europe where he investigated industrial production, Mr. Bryant was thoroughly familiar with his subject.

Without an economically healthy Uncle Sam, he asserted, European recovery could not be accomplished. Under present policies, he said, American industry is being weakened by loss of export markets, while production facilities abroad are rapidly being expanded.

American industry, he feels, could be more effectively strengthened if we took more initiative in the direction of our foreign aid. Few Europeans, according to Mr. Bryant, will give America credit for what is being done, and many look with suspicion on our motives.

Need Better Public Relations

We should do a better job of educating Europeans and others to understand our purposes, the speaker concluded.

Herbert L. Tigges, national officer and director, administered the oath of office to: Rolland H. Mogle, chairman; Raymond C. Peterson, first vice-chairman; Roy Dusseau, second vice-chairman; Dale H. Burke, secretary; and Elmer Faber, treasurer.

After installing the chapter executives, Mr. Tigges presented Lawrence F. Rothert, retiring chairman, with a past chairman pin. Mr. Rothert briefly reviewed his term of office and thanked all who worked with him.

Toastmaster for the evening was Judge Homer A. Ramey, who introduced the guests of honor: C. W. Pound, vice-president, Electric Auto-Lite Co.; R. B. Haynes, works manager, Spicer Mfg. Corp., Div. Dana Corp.; A. L. Baker, president, Baker Bros., Inc., and B. H. Sibley, plant manager, Champion Spark Plug Co.

Surface Only Scratched In Use of Hydraulics

Worcester, Mass.—Adaptability of the hydraulic circuit apparently is limited only by the ingenuity of the application engineer, Worcester members inferred from a lecture, "Use of Hydraulics in Metal Working," given by Everett O. Clark, district sales manager of the Worcester branch of Vickers, Inc.,

Mr. Clark was the technical speaker at a meeting held May 3 at Putnam & Thurston's Restaurant. With slides and films, he showed how hydraulic pumps, motors and valves function in activating modern machine tools.

Roger F. Waindle, ASTE director who is making a chapter tour, was a guest and spoke on the "Importance of the Tool Engineer."

University of Houston section of Houston chapter elected these officers to direct their activities. From left, front row: J. B. Rando, secretary-treasurer; John Carroll, assemblyman; J. L. Popham, chairman; C. W. Knecht, vice-chairman; and John Bailleres, chapter education chairman. In rear, C. R. Gamble and Chris Vogt, faculty co-sponsors

Describes Three Methods Of Casting Tantung

Windsor, Vt.—Harry W. Highriter, technical director of Vascoloy-Ramet Corp., Waukegan, Ill., spoke at the April dinner and technical meeting of Twin States chapter.

Discussing "Tantung Cast Alloy Precision Casting" before 50 members and guests assembled at the Windsor House, Mr. Highriter described several methods of casting Tantung. Sand, graphite, and investment casting he listed as the more popular practices.

For castings weighing from eight ounces to 50 pounds, he advocated the sand method. The graphite process gives fine grain structure and the hardness required for metal cutting applications. Where difficult machining might be encountered on small, intricate parts produced in large quantities, investment casting is used.

Lee Davis, chapter chairman, presided and introduced the speaker. Ernest Flanders presented a past chairman pin to William Hadfield, retiring chairman. Group singing, led by William Piper, was enjoyed between dinner courses.

Guests included friends from Springfield and Worcester, Mass.; Hartford, Conn.; and Pittsburgh, Pa.

Better Parts Design, Less Threading Trouble

New Haven, Conn.—With slides and chalk drawings, Joseph Benson, field engineer, Eastern Screw Machine Corp., illustrated problems encountered in cutting screw threads on automatic machines, for approximately 40 New Haven Tool Engineers. His lecture, "Automatic Screw Thread Cutting," was the technical feature at a chapter meeting held April 14 in the Dunham Laboratory of Yale University.

Mr. Benson emphasized correct design of threaded parts to eliminate some of the common troubles. Means of correcting misalignment were described in detail. In a subsequent discussion period, Carl Bettcher, president of Eastern Screw Machine Corp., explained work being done on the new unified thread system.

R. M. Strickland of Geometric Tool Co. was technical chairman.

ASTE Students Organize At University of Houston

Houston, Texas—University of Houston student members of Houston chapter have formed an active campus organization under the guidance of John D. Bailleres, chapter education chairman. The group holds monthly meetings and plans other activities of educational value.

Purpose of the student organization is to instill an interest in tool engineering, to provide opportunity to meet practicing tool engineers, and to prepare graduates for a place in industry.

Interest of the students is reflected in the tool design course installed by the university. Chris A. Vogt, a chapter member on the faculty, is actively engaged in teaching this subject. The students hope that the university will eventually offer a major in tool engineering.

The chapter assists the students with speakers and technical information not normally available in their regular college engineering courses. Enthusiasm of the students is evident in their attendance at chapter meetings as well as at their own campus programs.

At the initial meeting, held March 2, the following officers were elected: J. L. Popham, chairman; C. W. Knecht, vice-chairman; J. B. Randol, secretary and treasurer; Mr. Popham and John Carroll, assemblymen; and G. W. Maley, Jr., public relations officer.

C. R. Gamble and Mr. Vogt were named co-sponsors in line with the university's requirements of faculty sponsorship.

Record Crowd Hears Screw Machine Talk

Denver, Colo.—The largest attendance ever recorded at a Denver chapter technical meeting turned out to hear Robert R. Rhodehamel of National Acme Co. narrate the history, development and uses of screw machines and chucking machines.

Assisted by Harold J. Smith of the same company, Mr. Rhodehamel was guest speaker at a meeting held April 8 at the Oxford Hotel.

Portland Ladies, Guests At Installation Ceremony

Portland, Me.—Portland Tool Engineers installed their new officers in the presence of women guests attending the annual ladies night held recently at the Graymore Hotel.

Past Chairman John Johnston, the installing officer, swore in the following: Eldon L. Wishart, chairman; Howard W. Stevens, first vice-chairman; Clifford B. Smith, second vice-chairman; James Fildes, secretary; and Frank E. Thomes, treasurer.

Speaker for the occasion was Herbert Brown, professor of English literature at Bowdoin College. His amusing dissertation, "Words, Words, Words!" concerned the development of slang and its effect on more cultured conversation. References to tool engineers' passion for accuracy entertained the wives.

Jet Tooling, Broaching, Topics for Film Lecture

Springfield, Mass.—A technical film program was presented by Lapointe Machine Tool Co., April 11, before 40 members and guests attending a dinner meeting of Springfield chapter.

The motion pictures included "Tooling for Jet Propulsion," "Surface Broaching," and "Jet Propulsion."

Joseph Crosby, vice-president and sales manager of the Lapointe Co., discussed these subjects briefly and Howard Jones, engineer, answered questions.

Mr. Crosby, who is chairman of Boston chapter, invited the Springfield group to join his chapter in an inspection tour of the General Motors Framingham plant.

Because of enforced absence from the March installation meeting, Daniel Wesson, chairman, and Kenneth Stroble, treasurer, were sworn into office.

Stimson Names Features Of Unified Screw Thread

Chicago, Ill.—The recently developed screw thread standard to permit interchange of threaded parts manufactured in the United States, Canada and England was explained to Chicago members by G. H. Stimson, chief engineer, Gage Div., Greenfield Tap & Die Corp. Mr. Stimson was the technical speaker at a meeting held April 12 at the Western Society of Engineers headquarters.

The speaker, who has been associated with the standardization program, stated that the changeover will begin with machine screw sizes. From three to five years will be required for universal acceptance of the standard, he added.

The unified screw thread provides a freedom of fit between maximum screw size and the minimum hole. Both this and the existing thread tolerance system specify present flats and crests. The current British standard is a 60 deg form with rounded crest and root, while U. S. pitch tolerances have been based on diameter and pitch, not on pitch alone.

To distinguish between the unified and present systems, the symbol "B" is used with tapped hole specifications and the symbol "A" for threaded nuts. Differences in tolerances between the two systems were clearly shown in graphs.

Advantages of the new plan include high speed wrenching and larger tolerances on tapped holes. A committee now working on Class 5 fit is giving special attention to degree of surface finish, type of material, and length of engagement, Mr. Stimson informed the members.

* * *

Rev. L. Skibitzke, the coffee speaker, showed a color film, "God of the Atom." Physics of atomic fission were explained and the 184 in. Berkley cyclotron was shown. Smoke particles seen through a microscope showed the movement of particles of gas.

Special amplifiers made audible the rearrangement of atoms in a magnet as it was magnified. Photographs in color revealed the extensive atomic bomb damage at Nagasaki and Bikini.

Only hope of controlling this energy, Rev. Skibitzke concluded, is by recourse to God.

Anton Schwister, chapter chairman, presided and introduced the speakers.

Top: Wives of Portland (Me.) chapter officers saw them installed at recent ladies night. Standing, from left: Frank E. Thomes, treasurer; Eldon L. Wishart, chairman; Howard W. Stevens, first vice-chairman; James Fildes, secretary; Clifford B. Smith, second vice-chairman; Harold Andrews, alternate, and retiring chairman; and Past Chairman John Johnston, installing officer. Seated: Mrs. Harold Andrews, Professor Herbert Brown of Bowdoin College, speaker of the evening; and Mrs. Howard Stevens. Below: Part of dinner group attending annual social event

Credits Steel Industry with Progress of Century

Detroit, Mich.—Advancement of modern civilization during the past century has followed the discovery of the Bessemer method for making steel, according to M. W. Dalrymple, assistant metallurgical engineer on the staff of the operating vice-president of Bethlehem Steel Co.

Mr. Dalrymple emphasized this in a recent address before Detroit chapter on the subject, "Manufacturing of Iron and Steel."

Although iron has been used since the time of the ancient Assyrians and Egyptians more than 3000 years ago, its applications were relatively limited until 1856 when Sir Henry Bessemer received acclaim and knighthood for discovering that air forced through molten iron burned out the carbon and other impurities. A less publicized inventor of the process was William Kelly of Eddyville, Ky., who made the same finding in 1847.

About 1878 open hearth furnaces were introduced. With these two methods of making steel, construction of railroads, bridges and buildings expanded rapidly.

The speaker also described various types of iron and their composition. He showed a film, "How Steel Is Made," picturing operations in a modern mill.

Dr. Robert S. Drews, local psychologist, was the coffee speaker. His topic, "What Is a Normal Person?" concerned the effect of our changing civilization on humans. Combining serious and humorous aspects of the problem in an educational and entertaining talk, he pointed out the necessity of engineering one's life to suit his needs rather than his means.

Enters Partnership

Denver, Colo.—B. L. Golden of Denver chapter, ASTE, has formed a partnership with J. K. McGregor, known as Tool-Rite Machine Co., Inc.

The partners have acquired the facilities of the D. N. Berry Co. manufacturing plant and engineering works. They will specialize in development of patents and gadgets, along with die and general machine shop work.

Mr. Golden has had considerable experience in this field with the experimental laboratory of Bendix Corp. at Brooklyn, N. Y. He is treasurer of the local ASTE chapter and a former constitution and by-laws chairman.

Cedar Rapids members inspect and discuss tools and equipment displayed by Giddings & Lewis Machine Tool Co. and The Bellows Co., following technical program presented by these companies. From left: John Stark, chairman; Floyd Fisher, membership chairman; Elliott Wheeler, treasurer; Richard Coyner, John Speck, education chairman; Ray Bextine, past chairman; Edward Mead, Harry Soukup, speaker from Davis Boring Tool Div. of Giddings & Lewis, Robert Hruska, past chairman; and J. J. Mudd, Bellows Co. representative

Tooling Designed for Job Speeds Horizontal Boring

Cedar Rapids, Iowa—While many boring jobs can be done on a horizontal boring machine with standard tooling, machining can be accomplished faster and more accurately with tooling designed for the job, Harry Soukup, sales engineer for Davis Boring Tool Div. of Giddings & Lewis Machine Tool Co., asserted in a recent address before Cedar Rapids chapter, at the Montrose Hotel.

Models, slides and photographs illustrated his talk, "Horizontal Boring Machines, Their History, Uses and Adaptability." A lively discussion period followed his lecture, Mr. Soukup answering members' questions.

The Bellows Co. presented an exhibit and demonstration of air operated equipment. Cedar Rapids Mill Supply Co. loaned a drill press and an air compressor was furnished by Klinger Paint Co.

Dinner and installation ceremonies preceded the technical program. Retiring Chairman Ray Bextine administered the oath of office to: John L. Stark, chairman; E. H. Reinschmidt, first vice-chairman; John Allen, second vice-chairman; W. D. Popek, secretary; and E. H. Wheeler, treasurer.

R. A. Hruska, a former chairman, presented a past chairman pin to Mr. Bextine, who reviewed the activities of his administration.

Committee chairmen for the new year, announced by Chairman Stark, are: Floyd Fisher, membership; Carroll Bryant, editorial; Irl Yanaway, public relations; John Speck, education; John Wright, standards; and Edward Spangler, constitution and by-laws.

After dinner speaker was W. C. Pickard, who gave an amusing account of his experiences as a lumberjack in Alaska. Edward Klouda introduced him to the 29 members and 12 guests present.

Vederko, Works Manager

Mt. Gilead, Ohio—J. P. Vederko, formerly associated with The Cross Co. in Detroit, is now works manager for Hydraulic Press Mfg. Co. here, according to a recent announcement. He is affiliated with the Detroit ASTE chapter.

Erie Sees Wire Welding For Lamp Filaments

Erie, Pa.—Nearly 90 members and guests of Erie chapter visited the Sylvania Electric Products plant at Warren, April 5.

Following dinner at the Carver Hotel, Chairman A. E. Weingard introduced Robert J. Wilson, responsible with fellow members and employees for arranging an interesting plant tour.

Mr. Wilson presented Arthur Chapman, general manager, who outlined the tour and explained plant operations to be shown.

The engineers then proceeded to the plant, where staff members affiliated with the chapter guided the party in small groups through the processing of welded wire in the glass stems of electric lamp filaments. Highlights included wire drawing, plastic molding and electro wire welding operations. Grinding and inspecting of diamond draw dies also came in for attention.

A chartered bus and private cars conveyed the Erie group. Members from Meadville and other cities also motored to Warren for the event.

Binghamton ASTE'ers Attend Council Dinner

Binghamton, N. Y.—The Technical and Engineering Council Societies of the Southern New York area held their 11th annual dinner, April 29, at the Arlington Hotel. A charter member of the organization, Binghamton chapter, ASTE, was represented by its two councillors, A. G. Pangburn and R. B. Andrews. Attendance included 165 members of the affiliate societies.

Principal speaker was Roger F. Waindle, general manager, Sapphire Products Div., Elgin National Watch Co. He discussed the manufacture of synthetic sapphires. A sound film showing the grinding, lapping and drilling of sapphire bearings augmented his talk.

Mr. Waindle described many applications of sapphire bearings in instruments and industrial products. Manufactured in various shapes, the synthetic stones are used for wear strips, gages and anvils.

Precision Casting Offers New Field for Tantung

Worcester, Mass.—"Tantung Cast Alloy Precision Casting" was explained to some 75 Worcester Tool Engineers attending a chapter dinner meeting, April 5, at Putnam & Thurston's Restaurant. Speaker was Harry W. Highriter, technical director of Vascoloy-Ramet Corp., Waukegan, Ill.

Mr. Highriter described and illustrated with slides the method of turning this hard material into small, precise castings. The investment casting process involves the use of small flasks, approximately 4 in. diam. x 8 in., which carry the wax pattern surrounded by the baked ceramic mold. At present such castings are limited to approximately one pound.

After the wax has been melted out of the mold, the cavities are filled with Tantung in a centrifugal pouring machine. Used widely as a cutting tool, Tantung alloy, whose hardness range lies halfway between high speed steel and carbide, will be still more useful in castings wherever high red-hardness and wear resistance is desired.

Committee chairmen announced by Carl D. Schofield, chapter chairman, are: C. L. Morse, program; R. G. Nutting, membership; E. R. Ljungquist, entertainment; L. F. Mulno, standards; J. E. Rotchford, publicity; C. W. Monigle, industrial; G. A. Peterson, education; H. W. Wilder, constitution and by-laws; and Richard Prouty, editorial.

Starts New Business

Yonkers, N. Y.—Eugene Roth, formerly Eastern sales manager for Vascoloy-Ramet Corp. of Chicago, has formed his own company in the name of Eugene Roth, Inc.

The new firm is exclusive representative for Vascoloy-Ramet and for Beaver Tool & Engineering Corp.

Mr. Roth has been in the carbide field since 1929 when he introduced the German-made Widia materials in this country.

He has held offices in Worcester and Greater New York chapters of ASTE and is a member of ASM.

Rufus Wilson (left) of Wilson Electric Co. and Ralph Organ receive applause of Kansas City chapter after electrical demonstration with apparatus shown on table

K. C. Members Guests Of Student Affiliates

Kansas City, Mo.—Following dinner at the Advertising and Sales Executives Club, 35 members and guests of Kansas City chapter journeyed to Lawrence, Kan., April 6, to meet with a student group of 60 Tool Engineers and guests at the University of Kansas. Technical program for the evening was in charge of the student ASTE'ers.

Dr. A. W. Davidson, professor of chemistry at the university, discussed and demonstrated liquid air. Air, Dr. Davidson pointed out, has a critical temperature of -140 deg C or -220 deg F and a boiling point of -190 deg C or -310 deg F.

Liquefaction of air is accomplished by subjection of a reasonable volume to about 200 atmospheres pressure. As the air is allowed to escape from the pressure vessel, the rapid expansion causes considerable energy to be absorbed within the air mass.

Tends to Boil Away

This results in cooling to a point where the air becomes liquid. Preventing the liquid from rapidly boiling away is difficult. Insulated vessels can be used, but a vacuum is best. After standing for a short time, the liquid air becomes blue due to the concentration of oxygen. The nitrogen will boil faster due to its lower boiling point.

Dr. Davidson demonstrated the effect of immersing various objects in liquid air. Carnations froze quickly and their petals crumbled when pressed together with the hand. Rubber tubing became so hard that it could be broken readily. Steel wool, charcoal, tobacco, and aluminum dust were dipped into liquid air after the nitrogen had boiled off. When touched with flame these materials burned rapidly.

Commercial uses for liquid air are limited, according to Dr. Davidson. It is a good source of gaseous oxygen since the oxygen present is very concentrated. It is useful also in a number of laboratory experiments.

Names Six Advantages Of Thread Rolling

Elmira, N. Y.—Guest speaker for the May meeting of Elmira chapter was A. Bradford Reed, president of Reed Rolled Thread Die Co., Worcester, Mass. His subject, "Recent Developments in Thread Rolling," was enjoyed by an exceptionally large gathering.

The speaker named the six major advantages of thread rolling in the following order: speed, economy of material, extreme accuracy and uniformity, high finish, improved strength of work, and versatility. Each point was explained in detail with the aid of slides.

Donald K. Smith, first vice-chairman, introduced the speaker.

Spectacular Show Exhibits New Uses of Electricity

Kansas City, Mo.—At the direction of Rufus Wilson of Wilson Electric Co., Independence, "Wilson's Willing Watts" performed dramatically before some 50 members and guests of Kansas City chapter.

Mr. Wilson's demonstration of electrical phenomena was presented during a meeting, May 4, at the Advertising and Sales Executives Club.

By applying low frequency to high voltage, Mr. Wilson made flame travel up two forks of his apparatus, then break a circuit with a loud crack. This principle, said the demonstrator, is used by power companies to break circuits.

With an oscilloscope he projected sound waves on a screen. Then by means of a special flashlight, Mr. Wilson sent sound over a light wave.

Using several solid steel balls suspended by strings between two bars, he showed how momentum is transferred from one ball to another. This type of experiment has proved the earth to be solid throughout.

A magnetic apparatus hurling aluminum rings exhibited its repellent powers. In another demonstration a Strobotax made a checkered disc revolving at high speed appear to rotate slowly or to be completely motionless. This method is used to check rotating parts of machines for defects. It can be applied also in checking speeds of rotating parts, if frequency is known.

The exhibition also included the use of black light to bring out the fluorescence of various materials.

Executive Secretary Visits Philadelphia

Philadelphia, Pa.—Officers, committee chairmen and co-chairmen of Philadelphia chapter attended a special dinner meeting, April 13, with H. E. Conrad, executive secretary from the Detroit office, as guest.

Addressing the group Mr. Conrad reviewed past activities at national headquarters and outlined plans for the future.

He explained how to approach prospects in the current membership drive. Co-operation of top management will be solicited by those in position to contact industrial executives and acquaint them with the Society's activities. Inviting engineer prospects and management executives to chapter meetings will help build membership, he indicated.

Mr. Conrad also pointed out how the Society will gain prestige with the forthcoming publication of the "Tool Engineers' Handbook." In closing he appealed for membership cooperation in promoting national projects.

Dayton Group Visits Pipe Fitting Plant

Dayton, Ohio—Kuhns Brothers Co. conducted nearly 100 members and guests of Dayton chapter on a tour of inspection of their plant, April 11.

Dinner at Sacksteder's Restaurant preceded the visit. R. W. Kuhns, Walther Kuhns and James Kuhns outlined the history of their company since its establishment in 1887, before the party proceeded to the plant.

There the engineers saw how some 3000 shapes and sizes of cast iron pipe fittings are manufactured. The drafting and pattern department furnishes the original drawings of fittings conforming to ASA standards. All production patterns are made in this department.

In the core room the visitors watched sand cores being made. For fittings up to three inches, cores are made of dry sand, then baked in drawer ovens at about 450 deg F. Green sand is used for larger fittings.

The foundry has two cupolas operating alternately on the two eight-hour shifts. Iron is poured from ladles supported by monorails. On an average two-shift week, the workers pour and mold some 550,000 pounds gross weight. Small fittings are cleaned in wet tumbling mills, the larger in dry mills.

Tapping machines designed and built by the company's first engineer are used in the tapping and machining department. Although still accurate, the machines are gradually being replaced by faster motorized equipment.

All taps, tap holders, jigs and fixtures for the tapping department are made in the machine and maintenance department.

The tour concluded with inspection of the warehouse where fittings are weigh counted, and washed in an anti-rust solution before storing.

Detroit Arsenal Shows How It Rebuilds Tanks

Detroit, Mich.—More than 700 members of Detroit and neighboring chapters visited the Detroit Arsenal in Centerline, April 14. The wartime Chrysler tank arsenal is now operated by Army Ordnance to develop automotive equipment for all the armed forces of the United States and for such manufacturing and rebuilding of this equipment as is not economically obtainable from industry.

Guides escorted the engineers in small groups, showing the large boring mills, planers, cranes, X-ray machines and other equipment needed to produce modern combat tanks.

Here old tanks are torn down and completely rebuilt, incorporating all of the newest improvements. By this means the government acquires new and formidable tanks at low cost.

At the end of the final assembly line, the ASTE'ers had an opportunity to ride around the test track in one of the remanufactured tanks. Those lithe enough to squeeze themselves through the hatches rode inside the armoured tractor; others clung to the exterior.

After the tour dinner was served in the plant and Col. D. J. Crawford, commanding officer and host for the tour, described the work of the arsenal. The installation and its products, he stressed, are "yours"—not the Army's.

Monta O. Cox, chapter chairman, introduced the speaker.

* * *

On May 4 the chapter held a dinner dance at the Detroit Yacht Club. With the Detroit River in the foreground and the night skyline of the city as a backdrop, the engineers and their women guests dined and danced the evening away.

Monta O. Cox, chapter chairman, welcomed the group. Sponsors, whose cooperation made the clubhouse available for the affair, were: A. E. Glen, E. J. Becker, William Fors, Walter Jatkoe, Chester Ricker and George Whitehouse.

Bellamy Installs DeVore As Saginaw Valley Head

Flint, Mich.—Harold DeVore of A. C. Spark Plug Div., General Motors Corp., was installed as chairman of Saginaw Valley chapter at a recent dinner meeting at Zehnder's Hotel in Frankenmuth.

Installing officer was L. B. Bellamy of Detroit, national standards chairman, who also swore in: Benjamin Phillips, Jr. of Lufkin Rule Co. as first vice-chairman; Russell M. Ayers of Buick Motor Div. of General Motors, second vice-chairman; Clyde Fanning of General Motors Institute, secretary; R. J. Fonger of Illinois Tool Works, treasurer; and Ralph Cook, of Chevrolet Motor Div. of General Motors, delegate.

Technical feature was a discussion of the torque converter automobile drive by W. R. Coughtry, chassis division engineer from Buick Motor Div. His talk was augmented with slides and a model.

Speed of Future Jets Depends on Design, Materials

Hamilton, Ont.—Hamilton chapter learned about construction and operation of jet propulsion engines from R. V. Corlett, chief methods engineer for De Havilland Aircraft Corp., at a recent dinner meeting at the Iroquois Hotel, Galt. His topic was "Jet Propulsion and Tooling on the De Havilland Goblin Engine."

Mr. Corlett compared the jet engine to a toy balloon. When the balloon is blown up and released, the escaping air propels it forward. With the jet engine air is sucked in with an impeller, heated to increase the volume and pressure, and forced out the rear, causing a reactionary force in the opposite direction.

Future speed of jet planes, he said, is entirely dependent on design and materials capable of withstanding high pressures and temperatures encountered. Combustion temperatures of 1620 deg F., turbine speeds of 10,200 rpm, and pressures up to 3,000 lb psi require tough, durable materials. This presents problems in tools and methods for machining parts.

Following his installation as chairman of Hamilton chapter, George Gilmour (right), accepts custody of chapter charter and gavel from Gordon Hall, retiring chairman

The speaker envisioned the peacetime use of jet engines for commercial planes capable of flying between New York and London in four hours. In closing, he emphasized that if peace is to have teeth, Britain and the friendly nations must have positive security against belligerent powers. This is possible only with an adequate fighter force, he concluded.

Slides, a sound film and exhibits aided the speaker in the skillful handling of a difficult subject. Frank Lewis thanked him for his address.

Gordon Hall, chapter delegate to the Pittsburgh convention, reported on the house of delegates meeting.

Robert B. Douglas of Montreal, Society president, installed the 1949 chapter officers. They are: George Gilmour, chairman; George Churchill, first vice-chairman; William Peacock, second vice-chairman; William Shaw, third vice-chairman; John Yorick, secretary; and John Snyder, treasurer.

As retiring chairman, Mr. Hall transferred the chairman pin, chapter gavel and charter to Mr. Gilmour.

Following the installation President Douglas addressed the new officers and presented a past chairman emblem to Mr. Hall.

Speakers' table guests included Herbert L. Tigges of Toledo, Ohio, first vice-president, and visitors from Galt and Guelph. There were 171 present.

Wichita Entertains Engineering Societies

Wichita, Kan.—On April 13 Wichita Tool Engineers were host to other local chapters of engineering societies. Some 125 members and guests of the various organizations attended the dinner meeting at Woolf's Cafeteria.

Kirby Thornton of the Development Div., Aluminum Company of America, presented an informative lecture on "Post War Development of 75 ST Aluminum and Its Relationship to Shop Practices."

Mr. Thornton described outstanding properties and characteristics of this metal. He also explained methods employed to realize the full benefits of the relatively new alloy and how to avoid trouble in fabricating it.

Augmenting Mr. Thornton's address was a color-sound film, "The Curiosity Shop," based on the human side of development work.

Guesswork Eliminated With Electronic Devices

Windsor, Ont.—Speaker at a well-attended meeting of Windsor chapter, April 11, was James Meehan, in charge of grinding machine sales for Brown & Sharpe Mfg. Co. The program, "Precision Machining and Electronic Measuring," was sponsored by the Canadian Fairbanks-Morse Co.

Mr. Meehan traced his subject from the early days of tolerances at the turn of the century. Grinding, then considered an art, has now become an exact mechanical operation.

Illustrating his talk with slides, the speaker exhibited new electronic devices which eliminate guesswork and wasted effort from machine setup and checking.

Walter Appleton, Toronto member of the National Membership Committee, spoke briefly. He compared membership in the several Canadian chapters and discussed committee plans.

Mr. Appleton, one of Mr. Meehan's former apprentices and Canadian representative of Brown & Sharpe, accepted an invitation to introduce the speaker.

Little Rhody to Disport At 'Down East' Outing

Providence, R. I.—Little Rhody chapter will hold its annual outing Saturday, June 18, at Ye Kingstown Inn on U.S. Route 1, 16 miles south of Providence.

Beginning at noon, chowder, clam cakes and "little necks" will be served. The old-fashioned "Down East" field day will include such sports as golf, baseball and horseshoe pitching. There will be cards for armchair athletes and a surprise program for the ladies.

Dinner and the awarding of prizes will conclude the event.

Metallurgist Scores Misuse of Tool Steels

Poughkeepsie, N. Y.—Poor selection is one of the greatest abuses of tool steels, R. F. Spillett, metallurgist from the Sanderson-Halcomb Works of Crucible Steel Company of America, stressed before a gathering of about 60 members and guests of Mid-Hudson chapter, April 12.

To gain some desirable property in tool steel, he said, it is often necessary to sacrifice some other characteristic. When hardness is increased, toughness is lowered; when maximum wear and abrasion resistance are met, machineability will be difficult.

Carbon steels are best known for differential hardening, giving a hard, wear resistant surface and a soft, shock resisting core. They are not adaptable to tools with sharp corners, abrupt section changes or extreme variation in mass.

Additional alloying elements give oil-hard steels the power to fully harden, even in large sections, by immersing in oil. The slower cooling rate required to obtain full hardness makes these steels safe to use in applications where sharp corners, abrupt section changes or unusual designs are involved and where slight size changes are desirable.

Air Hardening Steels for Long Runs

Because of their slower quench, air hardening, or high carbon high chromium, steels are non-deforming during heat treatment. They are readily adapted for designs of an intricate nature and suitable for long production runs.

Chief characteristics of hot work steels are resistance to: softening in service, heat checking and cracking on hot applications, and wear resistance even at elevated temperatures.

High speed steels are named for their outstanding ability to maintain a keen cutting edge when used under conditions of high speeds, heavy cuts and heavy feeds. Their main application is for cutting tools, Mr. Spillett stated.

Before the technical session Roy F. Jackson, columnist, gave a coffee talk on "Poughkeepsie 150 Years Ago."

During a business session Ornendo Freer was elected second vice-chairman to complete the unexpired term of Robert H. Sedgwick, who had resigned due to pressure of business.

Llewellyn H. Tenney, chapter delegate, reported on the Pittsburgh convention.

New members introduced included: Quito H. Recchia, Henry Schlesinger, Walter G. Thomson, John L. Ladzinski, Jr., and Albert Payne. Joseph L. Petz, chapter chairman, presided.

Carboloy Promotes Crump

Detroit, Mich.—Harry Crump, for the past year manager of cutting tool sales engineering, Carboloy Co., Inc., Detroit, has been appointed assistant to the sales manager, K. R. Beardslee, vice-president and marketing manager, has announced.

A member of Detroit chapter, ASTE, Mr. Crump also serves on the Handbook Committee.

Hartlep Informs Students About Process Procedure

Detroit, Mich.—Frank Hartlep, chief process engineer, Pioneer Engineering & Mfg. Co., was the principal speaker at a recent meeting of the Detroit College of Applied Science section of Detroit chapter. Mr. Hartlep addressed about 50 students on the subject, "Processing."

Usually, he said, processing starts with a product design, but in some cases the engineering department consults the process engineer in the early stages of product design in order to obtain maximum effectiveness at minimum cost.

Then the process man must examine the design very closely, not only to note critical dimensions but also to establish a unit cost. From this study he sets up a sequence of operations and the machines, tools, gages, heat treatments, finishes and conveyors necessary to produce the part.

To illustrate, Mr. Hartlep showed a number of parts drawings, discussing in detail the processing of each part.

Frank Hartlep of Pioneer Engineering & Mfg. Co. explains Processing to 50 members of the Detroit College of Applied Science section of Detroit chapter. At left is Ernest Ladinig, chairman of student group

At the conclusion of the lecture Ernest Ladinig, section chairman and presiding officer, invited questions from the floor. In a brisk discussion period the students acquired additional technical information.

Monta O. Cox, Detroit chapter chairman, reported briefly on the Pittsburgh convention. George F. Bush, chapter education chairman, requested the section officers to keep him informed of all activities of the student group, so that the chapter can lend its support.

Broaching Used on Jets

Providence, R. I.—Oliver W. Bonnafe, chief research engineer for the Lapointe Machine Tool Co., Hudson, Mass., addressed approximately 60 members of Little Rhody chapter at a meeting, April 20, at Oates Tavern.

Mr. Bonnafe discussed "Jet Engine and General Manufacturing Problems Solved by Broaching." His talk, accompanied by motion pictures, was followed by a discussion period.

Koch Tells Nashville How to Select Steels

Nashville, Tenn.—Selection of Tool Steels was considered by Nashville members at a dinner meeting held April 22 at the Maxwell House Hotel. John A. Koch, assistant regional manager of Carpenter Steel Co., was guest speaker.

Mr. Koch emphasized proper design of parts, heat treat, grinding, and use of steel of sufficient section to allow for removing decarburization formed in rolling.

With slides he showed effects of incorrect design, grinding, heat treating and machining.

A general discussion followed the lecture, with Mr. Koch answering questions from an audience of 35 men.

Prior to the technical session there was a business meeting. Among guests introduced were: G. E. Haley and R. A. Wagner, tool design department, and J. E. Riordan, machine shop foreman, Nashville Div. of Avco Corp.; and August Dobert of Eisele & Co.

Installation of officers took place at the previous dinner meeting. O.W. Dresslar, a former chairman, administered the oath of office to: Sidney W. Stowell, chairman; Fred Wright, first vice-chairman; Scobey Rogers, second vice-chairman; J. E. Oglesby, secretary; and John Palmer, treasurer.

After the installation two films, "Story of Gasoline" and "California and Its Resources," were shown.

Success with Plastics Hinges on Application

Wichita, Kan.—Plastics are not a miracle material. They are merely another raw product whose correct application can produce goods economically with the desired properties.

W. J. Connelly, manager of the Consumer Relations Div., Bakelite Plastics Corp., pointed this out to 60 members and friends of Wichita chapter during a recent address, "Proper Perspective on Plastic Materials."

Illustrations cited the reduced costs and improved utility resulting through using plastics for parts previously made from metal.

Mr. Connelly also reviewed the early development of plastics to the present wide applications for home and industry.

Prior to the lecture the following officers for 1949 were installed: William Grabendike, chairman; Emanuel Pitsch, first vice-chairman; Hazen Dool, second vice-chairman; James Hill, secretary; N. L. McDaniel, treasurer; and Mr. Grabendike, delegate.

Airs Hydraulic Problems

Fond du Lac, Wis.—The new officers of Fond du Lac chapter conducted their first meeting April 8, at the Flamingo Club in Sheboygan.

A. M. Lane of Vickers, Inc., Detroit, discussed "Hydraulic Circuit Problems." His lecture was illustrated with slides of hydraulic circuit applications to holding fixtures, conveyors and other equipment.

Coming Meetings

BOSTON—June. Outing.

CENTRAL PENNSYLVANIA (York)—June 16. Stag party.

CHICAGO—June, date to be announced. Tour of Research Div., International Harvester Co.

CLEVELAND—July 1-4. Trip to New York with privately conducted tours of the city, entertainment, yacht trip.

DAYTON—June 13, 6:30 p.m., Suttmiller's Restaurant. Canadian Pacific color-sound film. July 11, 6:30 p.m., Fun Night, Lesourdsville Lake, four miles south of Middletown, Ohio, on Route 4. Chicken dinner, refreshments, games, swimming, and amusement park rides.

DETROIT—August 6. Golf Party, Indianwood Golf and Country Club, Lake Orion, Mich.

ERIE—June 18. Outing, General Electric Co. picnic grounds, Four Mile Creek.

HAMILTON—June 24. Annual Field Day, Cutten Field Golf and Country Club, Guelph, Ont.

LITTLE RHODY—June 18. Annual "Down East" Outing, Ye Kingstown Inn on U. S. 1, 16 miles south of Providence. Golf, baseball, horseshoes, cards, lunch and dinner.

MONTREAL—October 27, 28, 29. ASTE 17th Semi-Annual Meeting.

NEW HAVEN—June. Outing.

PHILADELPHIA—June. Outing. Philco television set to be awarded.

ST. LOUIS—July 9, 12th Annual Stag Picnic, Tammes Grove, St. Louis County. Members only.

Cedar Rapids Announces Membership Drive Prizes

Cedar Rapids, Iowa—Any member of Cedar Rapids chapter who signs up four new members will be formally recognized and awarded a dinner ticket for one meeting, Floyd Fisher, membership chairman, announced at the April 20 meeting of the chapter.

This incentive is expected to spur the tool engineers to participate in a continuous membership drive. During his remarks Mr. Fisher paid tribute to the work of John Speck, his predecessor.

After dinner and a business meeting, Richard Lucore of the Barron Mill Supply Co. introduced Carl J. Oxford, chief engineer of the National Twist Drill & Tool Co., Rochester, Mich., as technical speaker.

Mr. Oxford's talk, "New Developments in the Perishable Tool Field," was effectively illustrated with slides. Dwelling extensively on drills, drill points, speeds and feeds, he stressed requirements for various materials with respect to their machinability ratings.

Mr. Oxford concluded his informative lecture with an open discussion in which he answered interesting questions and problems from the floor.

The Barron Co. exhibited displays of products made by National Twist Drill & Tool Co. and Winter Brothers Co.

'SKF Night' Devoted to Quality Control Problems

Philadelphia, Pa.—SKF Night was observed April 21 by 235 members and guests of Philadelphia chapter attending a dinner meeting at the Engineers Club.

Charles K. Gotwals, quality control manager of SKF Industries, gave the principal address, "Quality Control in the Bearing Industry."

In order to regulate the degree of excellence of its products, said Mr. Gotwals, his company has established a three-point program: first, it has a thorough knowledge of the limitations of its gages and indicators and how to compensate for or correct their inherent inaccuracies; second, the firm instills in production employees the desire and ability to do work of acceptable quality. Finally, it determines inspection necessary to insure satisfactory quality at a competitive cost.

In some cases full inspection has been replaced by scientific sampling because inspector boredom makes the former method less efficient.

Coffee speaker was John Lawrence, general factory manager of SKF. He presented his ideas of management's responsibility in creating good working conditions. The four elements he listed as essential are: incentive, environment, competitive spirit, and long term objective.

H. W. Gross offered the invocation before dinner and Chairman William Chalfont led group singing, accompanied by an accordionist.

At the conclusion of the dinner, reports were given by: A. B. Luecke, membership chairman; P. A. Patterson, scholarship chairman; and Harry Smithgall, standards chairman.

Charles K. Gotwals (left) of SKF Industries tells Philadelphia chapter how his company established quality control. John Lawrence, also of SKF, discussed management's role in creating good working conditions

Situations Wanted

MECHANICAL-INDUSTRIAL ENGINEER seeks responsible position. Has served as chief engineer in automotive specialty field: project engineer, redesigning motion picture equipment and tooling for production; tool engineer, designing tools, special machinery, production lines; experimental engineer, developing electric motors and appliances. Trained abroad as toolmaker and draftsman. College graduate in mechanical, electrical, production, and optical engineering. Now studying industrial management. Single, age 28, willing to locate anywhere. Detailed resume on request. Box 169, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

SALES ENGINEER—Highly competent, energetic and successful, with engineering degree, would like territory franchises in and around Rochester, N. Y. Experience includes eight years in sales, application and servicing of all forms of carbide tools. Particularly interested in cutting tool lines or any good industrial product used in production or in the tool room. Has large following, is thoroughly familiar with all industrial plants and their personnel in this territory. Please write to Box 168, American Society of Tool Enginers, 10700 Puritan Ave., Detroit 21, Mich.

Outing to Finance Scholarship Award

Philadelphia, Pa.—The scholarship foundation of Philadelphia chapter will again award $500 to a sophomore mechanical engineering student at Drexel Institute of Technology. An additional $125 partial scholarship also will be presented to the 1948 winner.

The foundation is offering a second scholarship of $500 to a student of another engineering college in this area, as well as a $75 award to an outstanding student at Spring Garden Institute.

Funds for the 1948 scholarships were raised at the chapter's annual outing last summer, when a television receiver donated by Philco Corp. was the main prize for a chance drawing. A 1949 Philco television set will be offered at the chapter outing this month.

Obituaries

Fred W. Mebold, Sr.

Fred W. Mebold, Sr., mechanical design engineer of the James R. Kearney Corp., St. Louis, Mo., passed away April 18.

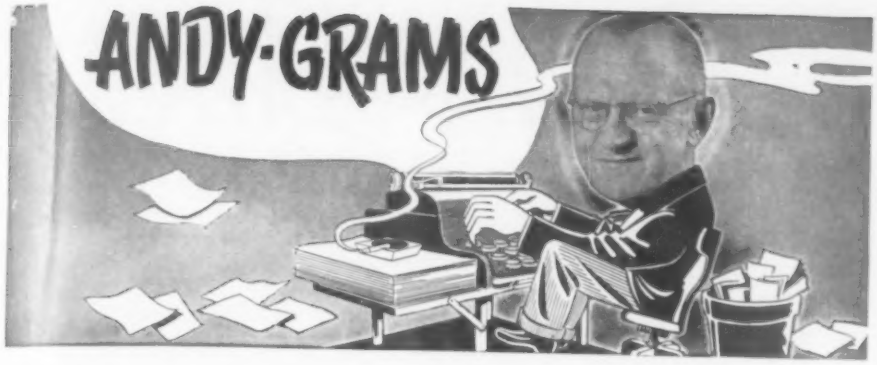
Mr. Mebold started with the Kearney Corp. in 1929, two years after the company was formed, as chief mechanical engineer, handling all tool design work. Recently he had devoted the major portion of his time to mechanical design of parts manufactured by his company.

He had been a member of the St. Louis ASTE chapter since 1946.

George Langen, Jr.

George Langen, Jr., for 35 years Cincinnati representative of several national machine tool companies, succumbed recently to a long illness, in Good Samaritan Hospital, Cincinnati.

Born in the Ohio city 55 years ago, Mr. Langer was a member of the ASTE chapter there and of the Cincinnati Engineers Club. He was the son of George Langen, a former president of the Cincinnati Planer Co.



AT ONCE REGRETFULLY, yet with a sigh of relief, we are winding up the collaboration on Aluminum Presswork by John Lengbridge and Aluminum Laboratories of Canada. It's been an interesting yet tough chore of editing, with trying to pack so much essential know-how into condensed form. Yet, like Jim Walker's articles of a while back, the series has gone over in a big way and, as a result of reader interest in both works, both John and Jim have had to double in brass as consultants—gratis, of course—on presswork problems. Thanks for the help, boys—typical, as one correspondent expressed it, of ASTE cooperation.

A letter from Gene Lahr, Sao Paulo, Brazil, saying that fire destroyed his records along with all his trade lit. See the ASTE News for details. Anyway, please send him catalogs and current releases, the guy being a long way from his sources and every little bit helps. I'm sure you boys N.E.W.S. will cooperate.

Also a letter from George Brown, Atlanta Chapter, along with some nice Gadgets you'll see by 'n' bye. George likes the way I mention names: ". . . sometimes it's someone of whom I've had no news in many moons." Well, I've been slipping a bit, the past year; like the little red hen and the big black rooster, I "don't get 'round as often as I useter." Anyway, it's nice to know that I'm still held in friendly regard by the Atlanta ASTEers, that going both ways.

A note from Eric Crawford, Toronto, with a clipping about one Edward Zorn—wonder is he any relation to Anders Zorn?—who makes a hobby of gun making. As for guns, I've thought of selling out my collection, all but a few items, a/c lack of time. But, considering that I've named 'em for the donors—All ASTEers, incidentally—there's a sentimental attachment. Besides, I've got me a lathe and other power tools and a nice li'l shop all rigged up in my basement so, once the spring chores are over I'll just get at those of my guns that need fixing, along with other gadgets on the agenda. Never a dull moment!

Went down to Sidney, Ohio, a few days ago, the occasion being the "unveiling" of a new roll turning lathe by the Monarch Machine Tool Company. You'll see it, along with other interesting innovations, in the Tools of Today. Renewed acquaintance with Wendell Whipp, now Ch'man of the Bd—and also with his pet flintlock; VP's Stan Brandenburg and Kermit Kuck; Art Killian and Dan McKellor. Mac still exudes the scent of heather along with a burrrr. A braw mon!

Also met Fred Dull; Adv. Mgr. Frank Pensinger, Al (Pete) Sherman, factory sup't, and A. J. (Red) Raterman, the latter not too many years ago a lathe hand at Monarch and recently stepped up to Prex. A nice organization symbolic of the American system of free enterprise, practically every man Jack having come up from the ranks.

While I was enjoying Monarch's hospitality along with other scribes, with Hill & Knowlton's friendly Len Church acting as MC, Clarence Etter was calling on the Sidney Machine Tool Company and other concerns in the territory who are also out with new ideas for cutting manufacturing costs. Teamwork, y'know.

Got back just in time to attend Detroit Chapter's meeting, where I turned in an application for membership and met Harold Carlson of Triplex Machine Tool Corp'n, N.Y., with greet'ngs fro and to John Cetrule of Triplex. Harold had as travelling mate Erik Garbom, *ingeniör* with Lidkopings Mekaniska Verkstad, Sweden—you know, the outfit that had that big centerless grinder at the last ASTE Tool Show. Through Erik, relayed greetings to Bill Sjöstedt and other ASTEers over there with whom we enjoy mutual acquaintanceship.

Speaking of membership, my invitation in May issue brought in Henning Freden of Aero-Nat Tool & Die, whom I now welcome into the ASTE fold. Y'see, it pays to advertise in the Tool Engineer. Also, on my behalf of the ASTE, a welcome to Roy Stafford of Plan-O-Mill Corp'n, making another good man come to swell our ranks. Anyway, I just want Fred Dawless to know that I didn't let him down on the pink ticket.

Day after the Detroit meeting, attended the Exhibition and Show put on by the Industrial Diamond Association of America, and sponsored by Detroit Chapter. There, had the pleasure of meeting Athos D. Leveridge, Exec. Mgr. of the Association, in addition to enjoying some rather remarkable movies as well as getting a deeper insight into the broadening uses of diamond tools.

Reminiscing with some old timers, t'other day, I was reminded of the time when, working in New York as a youngster, I joined the American Swedish Athletic Club over in Brooklyn. The membership was mainly made up of amateur wrestlers, weight lifters and other huskies among whom, weighing a scant 165, I was a mere pygmy among giants—not, for that matter, that I was exactly anaemic in my heyday.

When in town, professional acrobats would make the gym their HQ and, watching them, a quartette of us youngsters got a yen for tights and spangles and formed a troupe, with me as underman. But, I wasn't satisfied with such a static role; rather would emulate the "daring young man in the flying trapeze." Got so I could do the "cross" on the flying rings—but, try as I would, I just couldn't do the flip and land on my feet. Always on my leaden posterior!

"You've got a complex," said Gus, one of my team mates. "Tell you what, me'n Nels will stand by and if you go to fall we'll catch you." Fine, I thought, and got ready. "Alley oop!" But, spinning around and kicking my hands free of the rings, I felt a jolt in both elbows and a harder jolt as I hit the mat—on my sitdown as usual.

Indignant at what I took for the double-cross, I looked for my aides. And there they were, both stretched out cold on the floor. Seems one elbow caught Gus right on the button, and Nels—well, you should have seen his eye! Anyway, we decided I wasn't cut out for an aerealist besides which I had to quit anyway a/c an injury sustained in a football game a couple of years previously. As for my team mates, I later saw them doing their stuff at the Hippodrome. Eventually, they retired—acrobatics is a tough racket—while I wound up trying the patience of my fellow tool engineers. One thing I learned from my brief interludes as a trouper—did I tell you I was also a rapid sketch artist?—was to leave 'em laughing. May there be no moaning at the bar when I write the final "30" to the Column.

Handily Yours

Andy

THE TOOL ENGINEER'S *Service Bureau*

FREE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

Abrasives

Folder ESA-67 pictures (full size) line of mounted wheels and points for offhand and precision work and for grinding in hard to reach places; includes data on grains, grades, operating speeds; specifications and price lists. *Simonds Abrasive Co.*, Tacony & Fraley Sts., Philadelphia 37.

Aviation

"First in Flight", *Curtis Wright Corp.*, describes company's role in aviation and activity in developing recent forms of propulsion including turbo-jet, ram-jet, and rocket engines. 30 Rockefeller Plaza, New York 20.

Ballasts, Fluorescent Lamp

GET-922B discusses installation, operation, testing of ballasts as aid to electrical contractors, maintenance men, manufacturers; includes sections on starter switches, inductive and inductive-capacitive ballasts, inductive starting ballasts for d-c lamp operation, etc.; also test data, wiring diagrams. *General Electric Co.*, Schenectady 5, N. Y.

Bushings, Drill Jig

Illustrated booklet contains technical information, drill sizes, price lists, sizes and lengths of drill jig bushings. *American Drill Bushing Co., Inc.*, 1110 S. Santa Fe Ave., Los Angeles 21, Calif.

Cemented Carbide Grades

"Comparison Chart of Cemented Carbide Grades" tabulates type of material for which grade is suitable, characteristics, uses, approximate Rockwell hardness of the "A" scale, and lists standard and special equivalent grades of manufacturers' products. *Adamas Carbide Corp.*, 1001 S. 4th St., Harrison, N. J.

Cutters, High Speed

Line of high speed cutters with 3/32 in. shanks ground-from-solid after hardening. Available in fractional sizes and can be reground. May be used on power tools. Bulletin 16-LM, *Severance Tool Industries, Inc.*, 728 Iowa St., Saginaw, Mich.

Drilling Machines

Illustrated catalog No. 68 describes models D-24 and D-28, showing features of operator efficiency through V-belt drive direct from motor to transmission geared for 4-speed. *Sibley Machine & Foundry Corp.*, South Bend 23, Ind.

Drills

Easy-to-use catalog No. 48 contains technical data on cutting fluids, crankshaft pointing and pointing the drill; tables of tap drill sizes, cutting speeds plus drill dimensions established by American Standards Assoc. *Ace Drill Corp.*, Detroit, Mich.

Files, Curved Toothed

Brochure describes 150 shapes, cuts, sizes milled curved-tooth files for all metals, alloys and hard non-metallic substances. Includes rigid files with and without tang; flexible, curved and reveal files in addition to many types of metal and wooden holders. *American Swiss File and Tool Co.*, 410 Trumbull, Elizabeth 1, N. J.

Gear Units, Standardized

Anglegear standardized units for aircraft and high grade industrial application. Folder outlines design features; variations from standard design to suit special requirements. *Airborne Accessories Corp.*, 25 Montgomers St., Hillside 5, N. J.

Gray-Irons, Tailor Made

Thirty-two page brochure describes use of electric furnace-made alloyed gray irons, and possibility of selecting a type to meet requirements of product as means of improvement. *Frank Foundries Corp.*, Moline, Ill.

Grinders, Hydraulic

Illustrated catalog with specifications of six models stemming from two basic machines, including machines for toolroom, production, plunge grinding, and hydraulically operated hand grinder. *DoAll Co.*, Des Plaines, Ill.

Guards, Press

Two booklets explain Hoffman electronic controlled automatic safety guard for power presses; photos and schematic drawings show advantages; installation instructions and service notes. *Hoffman Engineering Corp.*, Anoka, Minn.

Honing, External

Bulletin No. 300 describes external honing equipment, including operation, results, types of stones, and size chart for general purpose sets for ferrous and non-ferrous honing. *The Motch & Merryweather Machinery Co.*, representing Delapena & Son, Ltd., Cheltenham, Eng. W. T. Cloor, 715 Penton Bldg., Cleveland 13.

Insulation, Roof

"Rock Cork Felt Sided Roof Insulation," by *Johns Manville*, pictorially presents advantages of use. 22 E. 49th St., New York 16.

Jig Borers

Thirty-one page illustrated booklet describes machines and uses in addition to discussing extra jig borer equipment, and specifications of range, speeds and feeds, floor space and weights. *Pratt & Whitney Div., Niles-Bement-Pond Co.*, West Hartford 1, Conn.

Locomotives, Diesel-electric

"Switching Power that Saves," GEA-5183, Apparatus Dept., *General Electric Co.*, Schenectady 5, N. Y., explains standard diesel-electric locomotives for industrial switching. Includes comparisons between steam and diesel-electric engines.

Lubrication, Small Machine

Booklet 4C describes how small-scale Bijur system can be applied to multiple oiling problems of small machines and isolated units of large machines. Illustrates automatic and one-shot units with positive control of oil flow to a fraction of drop. J. L. Parker, Sales Prom. Mgr., *Bijur Lubricating Corp.*, 43-01, 22nd St., Long Island City 1, N. Y.

Materials Handling

American Machine & Foundry Co. folder DM-518 shows use of company's industrial "Lowerators" as handling system for machine operations, progressive assembly or storage and transportation of materials. Lowerator Div., 485 Fifth Ave., New York 17.

Plug Gages

Pratt & Whitney "Go" and "Not Go" Reversible Plug Gages, both cylindrical and threaded, described in illustrated Circular 516. Gage size tables included. *Pratt & Whitney Div., Niles-Bement Pond Co.*, West Hartford 1, Conn.

Safety Directory

1949 Directory of Occupational Safety by *National Safety Council*, 20 Wacker Dr., Chicago 6. Indexed for quick location of posters on specific accident hazards. Range from 8½ x 11½ in. to 10 x 12 ft. Fifty cents.

Turning, Metal

Illustrated by photos, drawings, charts, data and specification sheets, booklet 1804 describes *Monarch Machine Tool Co.* (Sidney, Ohio) "air-gage tracer" controlled, automatic cycle, production machine for single-point metal turning.

Welding, Bronze

Six-page folder describes varied uses of flux-coated "Bronzochrom 185FC," development for use in place of bronze welding; includes case photos and technical data. *Eutectic Welding Alloys Corp.*, 40 Worth St., New York 13.

TOOLS OF TODAY

Monarch Announces Roll Turning Lathe

Close-up of a roll in place in the Monarch roll turning lathe. The contour is controlled by the tracer —right foreground—following the template. Standard carbide tools are used, with round-nosed tools used for all concave contours. Speeds run as high as 110 sfm, with feeds proportionate.

What is said to be the first successful Tracer Controlled Engine Lathe especially designed for turning of steel mill rolls was formally announced by The Monarch Machine Tool Company at a press preview held at the plant, Sidney, Ohio, May 11. The lathe, which combines improvements in carbide tools with lathe refinements in Monarch-Keller electrical contouring controls, had been previously demonstrated before steel mill roll experts.

That demonstration indicated that the machine could cut present machining time by two-thirds on even the toughest chilled cast iron rolls—enough, it is estimated, to retire its cost in about 18 months. The lathe will be built in two sizes—32 and 60 inch—with the smaller already in production.

Standard Tools Used

To arrive at a comparison of machining time, it may be stated that, at present, high speed steel form tools are used to turn steel mill rolls, with the operator gaging dimensions from a template. Turning speeds are established in inches rather than surface feet per minute.

In the Monarch lathe, standard carbide tools are used with speeds as high as 110 sfm, with contour controlled by a tracer unit which operates both carriage and tool slide feed through a medium of magnetic clutches. Because the contours are template controlled, round-nosed carbide tools may be used for an infinite variety of shapes. The only requirement is that the radius on the nose of the tool be smaller than the radius of the contour, if concave. Thus, a few standard tools will replace hundreds of form tools made necessary by present methods of turning. According to Monarch engineers, insert-type carbide tool has proven highly satisfactory.

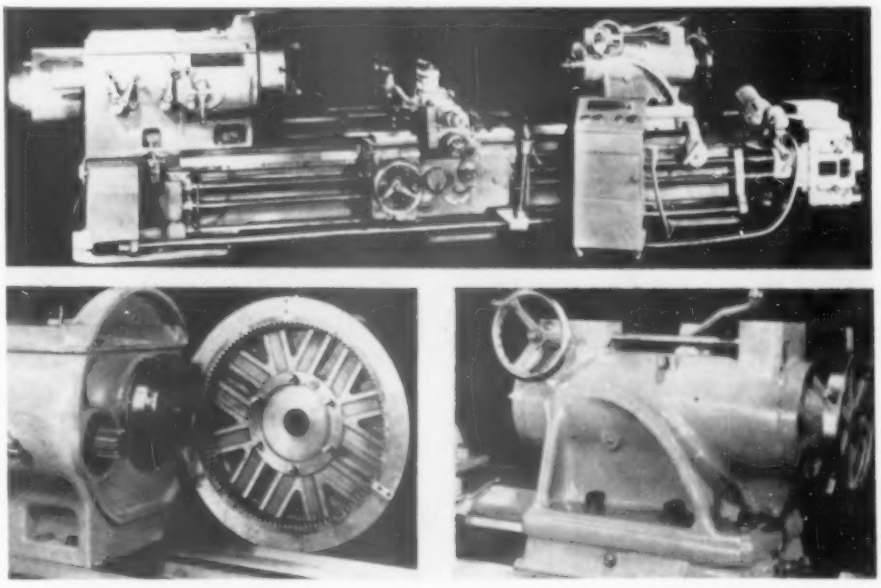
One advantage, claimed for the machine, is that while a template is required for every roll, or set of rolls, a considerable saving will accrue because, whatever shape is required or whenever a roll needs to be re-cut, the template will exactly duplicate the original contours. Moreover, the possibility of an operator inadvertently modifying the contour may be practically disregarded. The machine, not the operator, is master of the shape.

In operation, the Keller unit transmits longitudinal feed to the carriage by means of the leadscrew, and cross travel to the tool slide by means of the crossfeed screw. In this respect, the Keller control differs from most contour controls and is particularly applicable to roll turning. Also, both tailstock and headstock centers are of rotating type; therefore, there is no wear on the workpiece centers.

It might be explained, however, that the rotary headstock center is used with a special faceplate drive in which the spindle proper is normally stationary, as in a cylindrical grinder. Naturally, there would be no object in using a rotary center when the spindle and faceplate turn in unison. Drive may be through faceplate or spindle, as desired, an interlock preventing their simultaneous engagement.

Polls up to 24 inches in diameter may be satisfactorily positioned on centers on the 32-inch lathe. The neck supports ordinarily used for roll turning are not needed because of the greatly reduced tool pressure incidental with use of the small carbide tools.

One advantage of turning on centers is that, should the contours or forms require redressing or reworking, the roll may be remounted on the centers and both contours and roll necks may then be machined to renewed concentricity. **T-6-1**



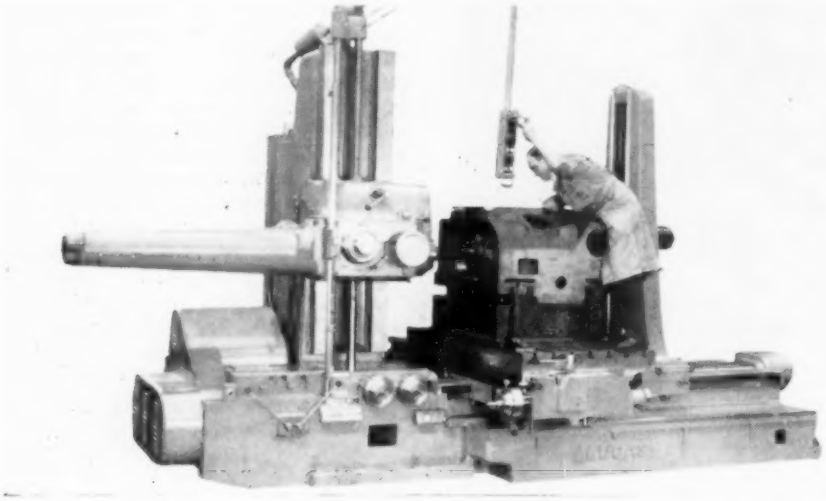
Top photo shows the 32-inch Monarch lathe for turning steel mill rolls. The Monarch-Keller unit, shown at extreme right, operates the carriage by means of magnetic clutches. The tracer is shown immediately in back of the tool post. At lower left, the face plate drive headstock, showing the internal gear and pinion for flow-speed forming operations. At lower right the specially designed tailstock, massively constructed so that thrust of heavy cuts may be taken in either direction. The tailstock spindle rotates in heavy anti-friction bearings as large as those used in the headstock.

Precision Boring Mills

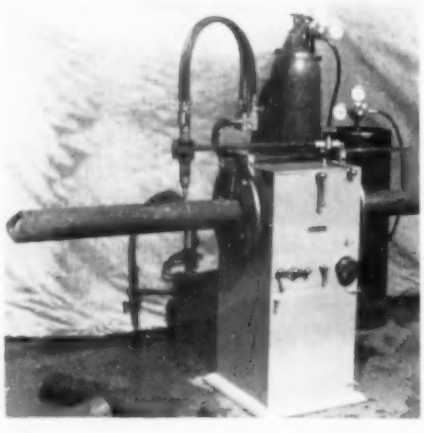
Illustrated is one model, of several, of an improved line of precision horizontal Boring Mills manufactured by Lucas Machine Division, The New Britain Machine Company, Cleveland, Ohio. The line is built in 3, 4, 5 and 6 in. spindle sizes with both electrically and mechanically controlled models.

In addition to improved design, the machines feature greater operating efficiency and increased versatility. They are further equipped with automatic power positioning for both table and head, a feature that allows the operator —using dial indicators—to accurately repeat on spacing operations, either horizontally or vertically. This feature reduces use of jigs and fixtures.

Work ranges of 26 x 26 in. to 94 x 84 in. are covered by the Lucas line. Speed range from 7½ to 850 rpm on 5 and 6 in. machines, to 13½ to 1500 rpm on the 3 in. machines, with special speeds available. Angular and vertical milling attachments, combination boring and facing heads, power and manually operated swiveling tables are offered as regular accessories. **T-6-2**



Tubular Profile Cutter



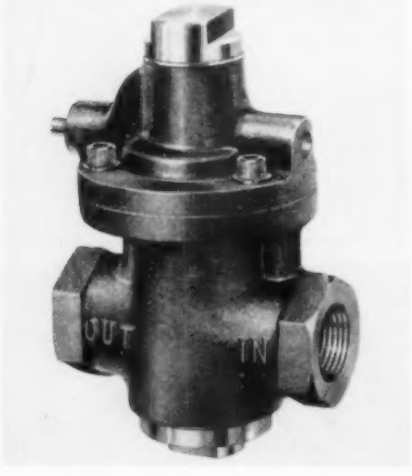
A semi-automatic machine — the Woerner "Tubular Profile Cutter", developed by the Heath Engineering Co., and sold by the Geoffroy Co., P.O. Box 67, Capitol Hill Section, Denver, Colo., is designed to provide a rapid and accurate means for forming shapes and profiles in pipe or tubing.

Rotation of the spindle is synchronized with the to and fro longitudinal movement of the carriage, upon which any standard machine cutting blowpipe can be mounted. A profile pattern or template controls carriage movement.

The machine is designed to produce mitre or angular cuts as well as profiles of several mating tubes or pipes up to 6½ in. O.D., either for small-lot runs or mass production. **T-6-3**

Valve to Control Coolant

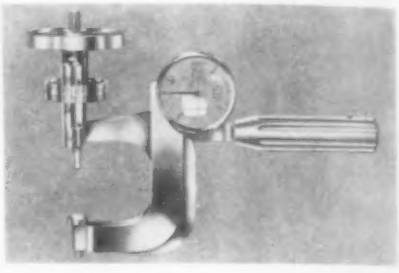
A "water-saver" valve, by Ross Operating Valve Co., Detroit 3, Mich., is a straight-way or shut-off valve, normally open or closed to the water supply and designed to allow the coolant to run when needed but to automatically turn it off between working periods. A time delay adjustment is set for maintaining the coolant flow for a period from 0 to 2¼ minutes after the machine cycle.



Operation of the valve is said to be purely automatic, requires no electrical or mechanical motivation and is generally activated by the same power which moves the machine cylinder. A "Pressure-Booster" modification is available for use when the cylinder pressure is less than the water pressure. **T-6-4**

Portable Hardness Tester

A "big Brother" to the Ames Portable Hardness Tester previously announced yet weighing only 2½ lb, Model 2—shown—is designed for testing larger dies, cutters, gears and other parts up to 2 in., and also for testing further in from the edge of sheet stock. In this instrument, the Rockwell penetration method is accomplished by applying pressure to the penetrators by screw action instead of by weights and levers; such as used in large bench-type machines.

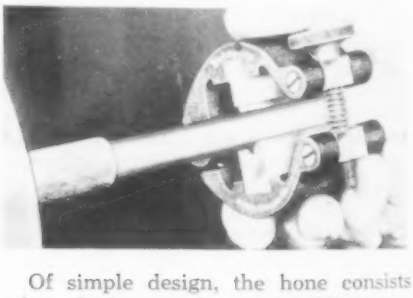


Tests are made directly in the Rockwell scales, with the penetrators and pressure loads specified in the Rockwell Conversion Chart. As the large handwheel is turned to increase pressure, the tester frame is forced open and the lever on the front lifts, causing the indicator hand to move around the dial.

In addition to advantages claimed—such as portability which permits taking the tester to the work—is a saving in original cost and that large parts may be tested without cutting off samples. The tester comes complete with all necessary attachments and accessories cased in an attractive box. Full details may be had from Ames Precision Machine Works, Waltham 54, Mass. **T-6-5**

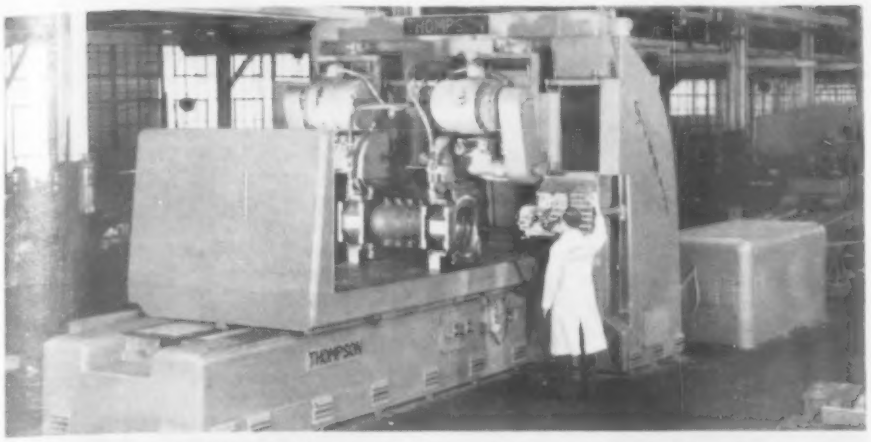
External Hone

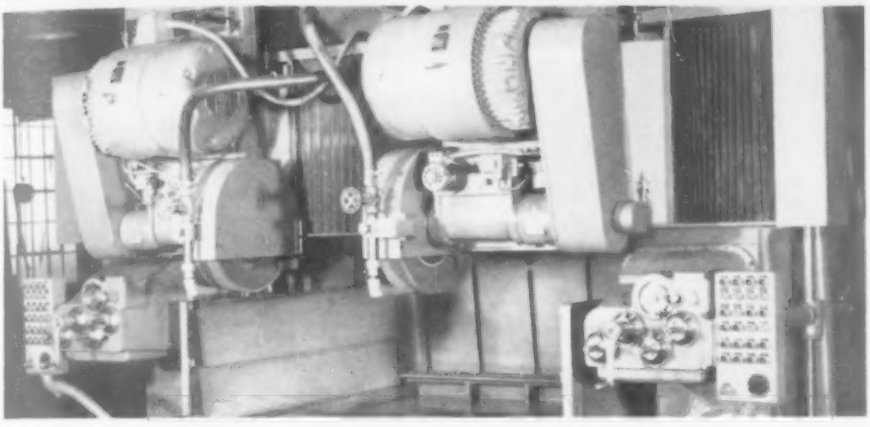
An External Hone—The Delapena, by Delapena & Son, Ltd., Cheltenham, England—is designed to produce precision external diameters with micro finishes quickly and at low cost, and to correct ovality and to remove taper.



Of simple design, the hone consists of a body member comprising two hinged parts, into which is fitted one of a series of guide blocks together with stone holders to suit diameter of work being honed. Three types of stones are supplied, for roughing, finishing and polishing. Complete information on this interesting tool may be had from the Motch & Merryweather Co., 715 Penton Bldg., Cleveland 13, Ohio, who are exclusive representatives for Delapena in the United States. **T-6-6**

Thompson Announces the Hydrail Grinder





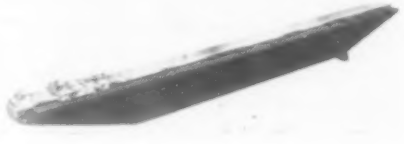
The Thompson Grinder Co., Springfield, Ohio, has developed a line of large machines to be known as the Thompson Hydrail Surface Grinders. These machines are especially designed to handle large work, from rough to finish in the one setup, up to 48 in. both vertically and horizontally and to table lengths up to 240 in.

The machines are said to handle many operations formerly done on planers, at at lower cost since roughing and finishing is done in the same setup. The machine illustrated, which was consigned to an English manufacturer, has two heads, operating independently or together, as required. In this case, the particular application was grinding wear strips in the horn guides of bearing and wheel casings. Clearance permits the entire assembly to be lifted into position for grinding, an item of savings in railroad maintenance shops.

The wheel head—or heads—is mounted on a massive bridge for rigidity, as shown in the lower photo, which also shows the respective controls and dial settings for the two heads. All cycles of operations are fully automatic, although manual control is provided. Table speed is adjustable from 10 to 100 fpm, and the machines are furnished with 36 in. and 48 in. vertical heads and 36 in. over the horizontal heads. The machine illustrated weighs over 65 tons. **T-6-7**

Measuring Machine

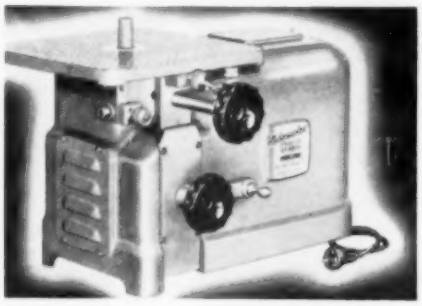
The George Scherr Company, Inc., 200 Lafayette St., New York 12, N. Y., announces a measuring machine for external and internal measurements designed for use as a master check and for determining extremely accurate dimensions on pin gages, standard bars, and end measuring rods. The measurements are obtained between hardened steel anvils, and flat jaws may be substituted for round plugs if desired.



For use in both systems, the precision steel scale is graduated in inches and in millimeters. The machine comes in two sizes: No. 1, with a measuring range of 80 inches, and No. 2, with a range of 120 inches. The slide carrying the varnier and measuring anvils is accurately fitted, and a fine adjustment screw has been provided. Vernier is of the easy reading Chesterman type, 2.450 in. long—a considerable improvement over the conventional $\frac{5}{8}$ in. vernier since readings may be made without use of magnifiers.

The width of the machine is 8 in. wide x $10\frac{1}{2}$ in. high, with length 8 ft. for model No. 1 and 11 ft. for model No. 2. Weight approximately 300 and 400 lbs., respectively. **T-6-8**

Profile Grinding Machine



A bench-type Profile Grinder is announced by Rice Pump and Machine Co., 1025-B S. 40th St., Milwaukee 4, Wis. Designed primarily for high-speed precision grinding of internal and external contours; or curved, odd and irregular surfaces, these machines are said to be especially adapted to the grinding of die clearances, sharpening cutter dies and punches; grinding cams and finishing hardened steel parts.

Features include a collet chuck which permits easy removal and insertion of grinding wheels and claimed to provide absolute true running of wheels; built-in diamond wheel dresser; compound tilting of work table 30 deg to front and 15 deg to side, to permit a wide range in grinding compound curves and angles; and vertical adjustment of 3¼ in. which permits using and dressing mounted wheels up to this height.

T-6-9

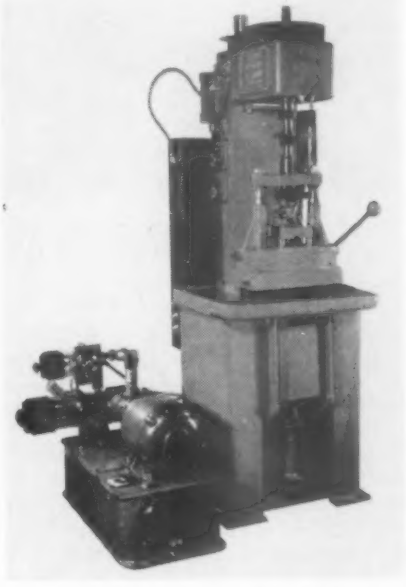
Vertical Honing Machine

The model "B7" Vertical Honing Machine has been added to the line of honing machines manufactured by the Staple Engineering Co., Birmingham, Mich.

This machine, hydraulically operated and electrically controlled, is adaptable to work having inside diameters ranging from ½ to 4 in. inclusive and up to 6 in. in length. Timing cycle is adjustable from 3 to 180 seconds, with standard equipment, and size control is manual by graduated dial.

The reciprocating work table is 6 in. wide x 18 in. long and has 8 in. travel.

A variable speed drive is provided to the honing spindle and is adjustable for ideal honing speeds. The honing stones are fed out and contracted automatically, and the pressure and rate of feed are adjustable to provide proper pressure for best results during the honing cycle. The machine is supplied complete with all electrical controls, self-contained hydraulic unit, coolant pump and tank. **T-6-10**



"Chrome Clad" Mikes

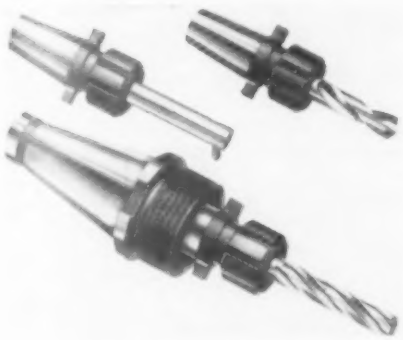
The Lufkin Rule Co., Saginaw, Mich., announces that all Lufkin micrometers will hereafter have a "Chrome Clad" Satin finish. The non-glare quality of this finish, which is also highly rust and wear resistant, makes reading easier in bright or poor light. Markings stand out sharp and bold.

To insure the highest degree of measuring accuracy the anvil and spindle ends have a micro-lapped, mirror-like finish. The one-piece spindle has hardened the ground threads for smooth action and long life. Other features are the cutaway frame, making it easy to get into hard-to-get-at places; rapid-reading—each thousandth graduation on the thimble numbered—and ease of adjustment, a method by which reading lines always maintain their original position directly in the line of vision.

T-6-11

"Kwik Switch" Tool Holder

Universal Engineering Co., Frankenmuth, Mich., announces its "Kwick Switch" Tool Holder as a device to rapidly change tools on jobs requiring multiple operations such as drilling, tapping and boring while still maintaining accuracy and rigidity not ordinarily found in tools of this type. Tool changes are said to be made in less than 10 seconds without loss of close tolerance accuracy.

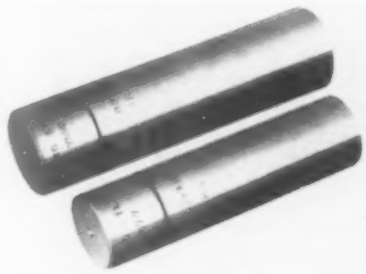


The master chuck fits into the machine spindle, and adapter chucks—which rigidly hold the tools—fit into the master chuck and fasten firmly with less than a quarter-turn of the locking nut, the latter designed that it can be turned by hand. As claimed, consecutive operations may be performed in a fraction of former time without readjusting tool, machine, or changing position of the work.

The "Kwik Switch" tool holders handle tools with either straight or taper shanks, and the master chuck is available in straight and taper shanks to fit all standard machine tools. **T-6-12**

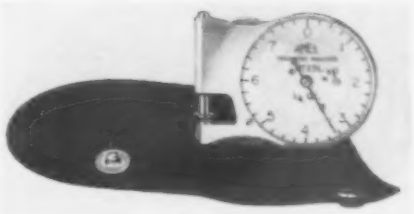
Revolving Turret Lathe Stops

As a result of wide acceptance of Revolving Stops by the screw machine industry, Boyar-Schultz Corp., 2110 Walnut St., Chicago 12, Ill., is now manufacturing these stops for turret lathes and the larger sizes of screw machines. These larger sizes are the 4RS with $1\frac{1}{2}$ in. shank, and the 5RS, with $1\frac{3}{4}$ in. shank.



As in the smaller size stops, particular attention has been paid to maintaining correct feed-out length under all operating conditions. The stops are precision made of high quality materials and hardened to withstand repeated impacts. The internal ball race is fully enclosed to prevent entry of chips or other foreign matter that might impair operation. **T-6-13**

Dial Thickness Measure



The B. C. Ames Company, Waltham 54, Mass., has added the No. 25L to its line of Dial Thickness Measures. This gage, which is calibrated in leather ounces, has been developed as an aid to leather manufacturers and buyers who must make on-the-spot checks of hides, leather strips and sheets.

The large, easy-to-read dial is calibrated in ounces, each graduation indicating $\frac{1}{4}$ ounce. In addition, a small dial and pointer, graduated in multiples of 8 oz., have been provided to allow checking of leathers up to 20 oz. weight to the nearest $\frac{1}{4}$ oz. The contacts, $\frac{1}{4}$ in. in diameter and open $\frac{5}{16}$ in., are non-adjustable to assure permanent alignment and parallelism.

An unbreakable crystal protects the dial face and, as claimed by the manufacturer, the instrument is ruggedly built for lifetime service with ordinary care. Included is a grain leather snap button case and complete instructions for use. **T-6-14**

Profile-Measuring Scope

A Profile-Measuring Microscope for high precision measuring and the control of profiles on the basis of enlarged drawings is now available from Hauser Machine Tool Corp., Manhasset, N. Y., U.S. Factory Representative of Henri Hauser, Ltd., Bienne, Switzerland.

This instrument is said to accomplish a comparison of the enlarged projected image with a correspondingly enlarged outline drawing of the particular tool, thread or gage 6, 10, 30 or 50 x full size, without special graticules which have imposed serious limits on the applications of such microscopic measuring. As the making of special graticules is a specialty, their elimination portends a considerable saving for the user.

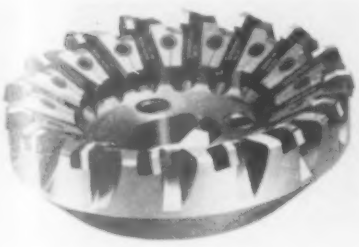
Among applications are: screw threads, as checking core diameters, pitch, angle of inclination, form of thread; measuring the cutting angle of tools, gages, templates, and edge of cutting tools; diverse measurements, as coordinate measurements of various workpieces and gages; checking profiles of diverse workpieces, tools and gages by comparing with enlarged drawings to scale.

For comparison and for the purpose of checking dimensions, only the contour outline of the object is drawn; the thickness of the lines is of no consequence and does not affect the accuracy of the measurements. The outlines of the profile drawing or tracing, which can be either in ink or pencil, will appear red when viewed through the eyepiece, the image of the object itself appearing green.

The advantages of this system are that the two different colors are in sharp contrast, the contour lines of the drawing and the image always showing up clearly, even in case overlapping occurs. T-6-15

Turn to page 72 for Handy Tools of Today coupon.

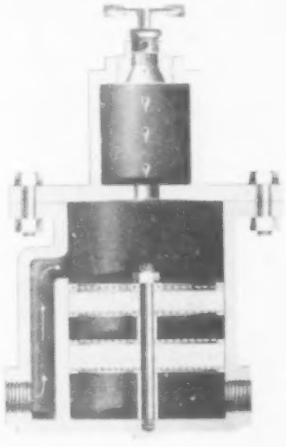
Heavy-Duty Face Mill



The Gairing Tool Co., 21221 Hoover Rd, Detroit, Mich., has added a heavy-duty model to their E-Con-O-Mill line of standard face mills. Designed for roughing operations where the greatest wear occurs along the periphery of the tool, this cutter features blades set at an angle to allow greatest adjustment in a radial direction.

Extra-heavy cutter bodies are made 8-in. diameter and over. All sizes are equipped with the same size of tungsten carbide tipped blades—the same blades and same locks as used on the regular — cone-type — E-Con-O-Mill. Blades are of three types for cutting steel, cast iron, and non-ferrous material and come finish ground, ready for work. **T-6-16**

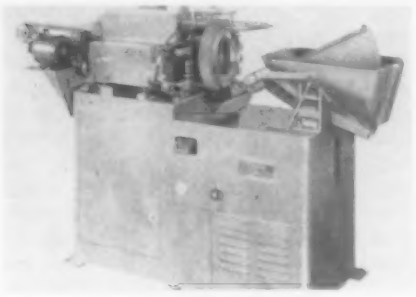
Compressed Air Separator



Designated "Murphy Paragon 'C'", the separator shown is said to remove the last trace of oil, moisture and dirt from compressed air at the point of use. It is designed for use in conjunction with such operations as fine painting, mirror silvering, blowing dust from highly polished surfaces or from surfaces subject to corrosion, and for "blowing out" of precision units during assembly.

Installed in the pipe line just ahead of the point of delivery, air enters the unit at top right and is conducted to the expansion chamber below the strainer cartridge by grids and spacers. The cotton felt pads are said to trap the last trace of oil, grit and moisture, and the dry, clean air is delivered immediately to use. Additional information may be obtained from the manufacturer, James A. Murphy & Co., Fifty and Vine Sts., Hamilton, Ohio. **T-6-17**

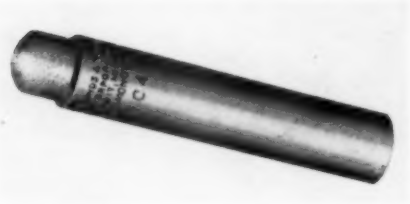
Slug Heating Machine



In an automatic Slug Heating machine, by Feedal Machine and Engineering Co., 70 Vine St., Willoughby, Ohio, the parts are dumped into the large hopper shown at the rear, where they are fed to the transfer dial and thence loaded into the inductor coil. As each slug is loaded into the coil, another piece ready for forging is delivered at the rear.

The machine shown was tooled for heating 1 in. dia. x 1 in. long slugs at a rate of approximately 20 per minute, and this unit is said to be adjustable for other different diameters and production speeds in proportion to the stock used. All transfer and pushing movements are air operated and can be quickly adjusted by the operator when needed. **T-6-18**

Universal Diamond Tool



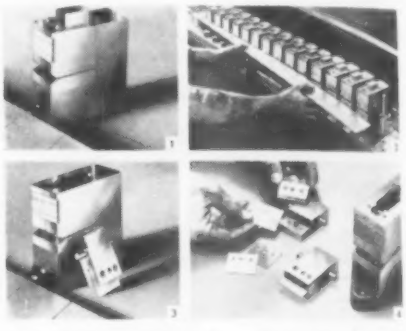
A universal Diamond Dressing Tool—the IC-4 announced by Diamonds and Tools, Inc. Dept. P., 19345 John R; Detroit 3, Mich., is designed for both rough and finish dressing or truing on surface, cylindrical, or centerless grinders. It is said to perform economically on all bond hardnesses of either aluminum oxide or silicon carbide grinding wheels.

Claimed to be comparatively "fool proof" from the human element standpoint, this dresser employs the use of numerous small solid diamonds evenly distributed throughout a special Colmonoy wear resistant matrix. These small diamonds are said to be far more economical than larger ones and to always produce a sharp cutting edge due to their small cross section. The tool does not require resetting and can be used up completely without removal from the grinder. **T-6-19**

Louver Notching Tool

A Wales Louver Notching Unit is announced by Wales-Strippit Corp., North Tonawanda, N. Y. One of its many uses, in the metal fabrication industry, is notching long slits in fluorescent fixture louvers.

Among features claimed for these notching units is the independent, self-contained design which permits the same group of units to be used over and again in unlimited setups in press brakes and stamping presses. Each unit is independently mounted to provide quick setups according to varying patterns, a flexibility of setups that keeps tooling investment in practically continuous productive operation.



All parts of the units—such as punches, dies and punch lifter springs—are built into the self-contained holder and therefore kept in permanent alignment. This feature eliminates the usual time-consuming adjustments required to align conventional notching dies. The press ram has only one function—to depress the punch, which is not attached to the press ram.

Setups on templates, which are combined base plates and notching patterns with holes for pilot pins and hold-down screws, reduce "down time". Templates not in active use may be stored and the notching units kept in continuous operation on other templates.

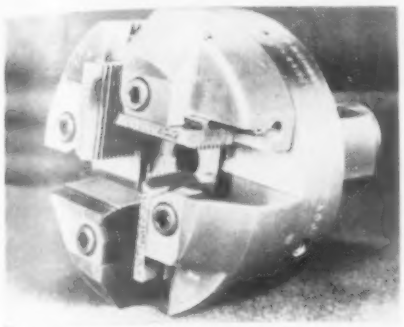
Complete information available on request. The photos, in order 1 to 4, show a close-up of Wales Louver Notching Unit with the work in foreground; a setup on a Wales "Strip" Template in a press brake; a close-up of unit with punch removed; and the interchangeable punch blade being replaced in the punch body. This feature permits sharp blades, rather than an entire notching unit, to "stand-by" for replacement of due blades. **T-6-20**

Floor Grease Absorbent

An improved Sol-Speedi-Dri, which absorbs floor greases and oils much as a bilge pump sucks up water, is announced by Safety & Maintenance Company, Inc., 1 Wall St., New York 1, N. Y.

The improved Sol-Speedi-Dri is said to be more absorbent and to make larger areas of slippery floor safe because it is fluffier and has 10 percent greater bulk per pound. In the words of the manufacturer, it is designed to put American industry "on a safer footing". **T-6-21**

Adjustable Die Heads



Landis Machine Co., Waynesboro, Pa., announces a solid adjustable Die Head for use on automatic machines for threading street ells and similar fittings where clearance is limited between the die head and the machine. The die head, 3¾ in. in diameter, consists of a heavy body with the chasers —bevelled 45 deg to provide further clearance—mounted on the face of the head body. Also, each individual chaser holder is adjustable plus or minus 1/32 in. on the pitch diameter.

While the same head body can be used, a different set of chaser holders is required for each diameter. The overall length of the head depends on the type of mounting used. The head shown, which is recommended for cast iron and brass fittings only, ½ and ¾ in. pipe thread, is driven by means of a square on the shank. It is centered by the cylindrical portion of the shank and held in position by a draw rod through the spindle. This head uses chasers 15/16 x 1¼ in.; the same size as used the Little Landis Head. **T-6-22**

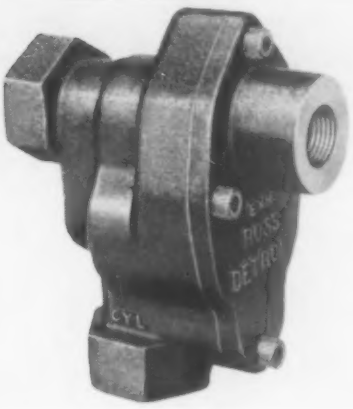
Diamond Abrasive Compound

A diamond abrasive—the Elgin Diamond Compound—manufactured by the Industrial Products Division of the Elgin National Watch Co., Aurora, Ill., made its bow to industry at the recent Production Show in Chicago.

Special advantages of the compound, which portends a greatly expanded field in the application of diamond abrasives, are said to be due to the exclusive synthetic vehicle which carries the diamond abrasive, and the extremely precise size grading of the actual diamond particles. According to the manufacturer, the compound permits the use of standard time analysis procedures in connection with lapping and polishing operations.

Developed as a result of Elgin research in special watch lubricants, the synthetic vehicle is said to resist caking or drying out, to be universally soluble in commercial solvents and water and to leave no drilling film or finished surfaces. Typical applications include finishing carbide and hardened steel parts, plastic molds, drawing dies, bearing surfaces, lapping of gages and polishing the cutting edges of cutting tools for increased life. **T-6-23**

Quick Exhaust Valve

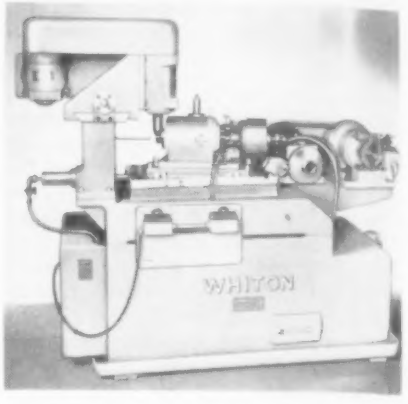


An auxiliary Air Valve said to enable cylinders to start their return stroke in a split second is announced by Ross Operating Valve Co., 120 E. Golden Gate, Detroit.

Known as a quick exhaust or dumping valve, this unit acts as a supplementary exhaust to the regular operating valve. When the latter is in open position and starts to exhaust, it automatically causes the auxiliary—which is mounted right at the cylinder—to "dump" the exhaust air thus permitting the cylinder to start its return stroke almost instantly. In other words, the Ross quick-exhaust valve is designed to effectively offset the distance factor since it releases the air right at the cylinder. **T-6-24**

Special Purpose Miller

The Whiton Machine Co., New London, Conn., announces a special purpose High-Production Milling Machine. Primarily designed for cutting bevel and spur gears and pinions, it is said to be readily adaptable to other milling operations as, for example, work requiring slots milled on the face or outside diameter; and hex, square or more sides to be milled.



The machine has a vertical spindle mounted in anti-friction bearings, individually motor driven through V-belts which allows the use of carbide cutters when available.

The table, of rigid proportions, is actuated by a combination of air and cam to impart the proper rapid advance to and from the cutting position and to produce the proper feed for the cut. An important feature is that, where necessary, the cam can be arranged so that in feeding into the work a constant area of cut can be maintained to remove a constant cubic inch of stock.

The machine takes work up to a capacity of 8 in. in diameter. Cutter speed, with high speed cutters, is 125 sfm; feed is .003 per tooth, variable to suit the work. T-6-25

Corrosion-resistant Steel

A super corrosion resistant stainless steel—Carpenter Stainless No. 20—is now available in the forms of sheet and plate. The sheet is produced in standard widths and lengths in gages from 24 to 11, and plate in thickness from 3/16 in. up.

Prior to its introduction in wrought form by Carpenter Steel a year or so ago, this material was available only in cast form, known as Durimet No. 20 and manufactured by The Duriron Co., Inc., Dayton, Ohio. Now, as a result of experiment and development by Carpenter Steel, it may be had in wrought bars as well as sheet and plate.

Said to retain all the good qualities of 18-8 stainless, its resistance to the corrosive effects of sulphuric acid and other corrosive agents, makes it aptly applicable in such manufacturing fields as heavy chemicals, synthetic rubber, explosives, plastics and pharmaceuticals. Complete information about this versatile material may be had from The Carpenter Steel Co., Alloy Tube Division, Union, N. J. T-6-26

Valves Designed for High-Pressure Service

A complete line of diaphragm-actuated two-pressure Merit valves is now available for a wide range of application in high pressure hydraulic service, it was announced by Emett Machine and Manufacturing, Inc., 2249-21 Fourteenth St., S.W., Akron 14, Ohio. The new Merit valves range in size from 1 to 4 in., and they can be furnished for operation on systems having 3000, 5000, and 10,000-psi pressures.

Variations of valve assembly provide for (1) diaphragm-controlled high-pressure inlet, (2) diaphragm-controlled slow-travel valve, or (3) diaphragm-controlled stop valve, all handled within one casting and with minimum pipe connections.

A feature of the valves is the interchangeability of seats and discs between main valve and check valve assembly; thus, it is necessary to stock only a minimum number of parts for emergency repairs. **T-6-27**

Shear with Remote Control Clutch Attachment

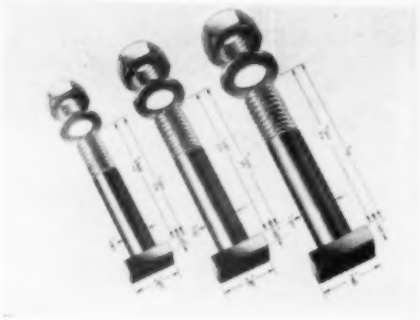
While the full-length mechanical treadle which is the standard clutch tripping arrangement on Cincinnati shears—meets the majority of requirements, there are times when remote control is advantageous.

On large volume shearing of wide or long plates or sheets, it would normally be necessary to have an assistant trip the conventional clutch lever. With the remote control—electric clutch attachment, it becomes a simple matter to place the foot switch at a position convenient to a single operator, thereby speeding handling and output.

The electric clutch control can also be furnished with two foot switches and a selection for single or double operator control. With double control both operators must operate the foot switches before the clutch will trip. **T-6-28**

Turn to Page 72 for Handy Tools of Today Coupon

Tool Post Bolts



Boyar-Schultz Corp., 2104 Walnut St., Chicago 12, Ill., announces a line of Tool Post Bolts, for automatic screw machines, made in three sizes: 3/8 in. for No. 00; 7/16 in. for No. 0; and 1/2 in. for No. 2 size machines.

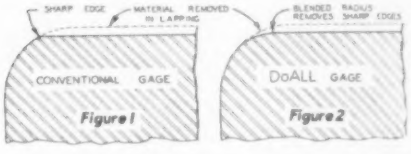
Suited to other uses as well, these additions to the Boyar-Schultz line of S.M.B. bolts are made from high-grade alloy steel heat treated for maximum properties. They are said to be extra tough and not to pull out under ordinary use.

Nuts are accurately made to assure Class 3 fit with the bolts, and washers are also accurately made with bearing surfaces ground parallel. Lengths available are: 1 3/4 and 2 1/2 in. in the 3/8 diameter; 2 1/8 and 3 1/2 in. in the 7/16 diameter; and 2 1/2 and 4 in. in the 1/2 diameter. **T-6-29**

'Burr Proof' Gage Blocks

Deviating from what is said to be both theory and accepted practice in the gage block industry—that is, that after the final lapping no further mechanical operations be performed—the DoAll Co., DesPlaines, Ill., now burr-proofs its gage blocks after lapping.

For a full understanding of the import of this innovation, DoAll explains that gage blocks are usually made with a radius, as shown in Figs. 1 and 2, which is intended to prevent damage to the corners during use. But, where this radius is provided prior to final lapping, a sharp corner results as shown in Fig. 1. On the other hand, a final lapped rounding, as by a special DoAll process, leaves the corners fully rounded as shown in Fig. 2.



The parabolic curve thus produced blends the original radius with the finished surface of the gage without in any way affecting the flatness or accuracy of the gage. It is estimated that the process will extend the life of a set of 83-piece gage blocks, such as shown in the photo, by about 100 percent. **T-6-30**

Lightweight 8 in. Grinder

An air-powered powered portable 8 in. Grinder, by The Aro Equipment Corp., Bryan, Ohio, features light weight to lessen fatigue in heavy duty grinding and polishing. Speed, whether idling or under heavy load, is governor-controlled to reduce air consumption.

The grinders are available in spade and straight handle models, 6 in. and 8 in. sizes, with selected range of speeds including 4200, 4500 and 6000 r.p.m. All models have 5/8 in. x 11 spindle thread. **T-6-31**

Automatic Recessing Tool

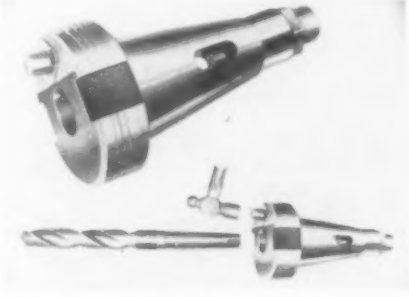
An automatic Recessing Tool—the 5-R, by Scully-Jones & Co., 1901 So. Rockwell St., Chicago, Ill., is designed for groving recessing, undercutting, front and back chamfering and similar operations from in-feed of the machine spindle. After the cut is made, the cutter automatically retracts on withdrawal.

A pilot on the tool enters the bore and centers the cutter. A stop collar then comes to rest on the part, and further down travel feeds the cutter into the work to correct diameter and in proper relation with and established face or gage point.

In the setup illustrated, grease groves are being cut in heavy-duty links. The bore is 4.500 in. and the groove, 3/32 wide x 1/16 in. deep, is held concentric with the bore. A production increase of over 100 percent over previous methods is claimed for the setup shown. **T-6-32**

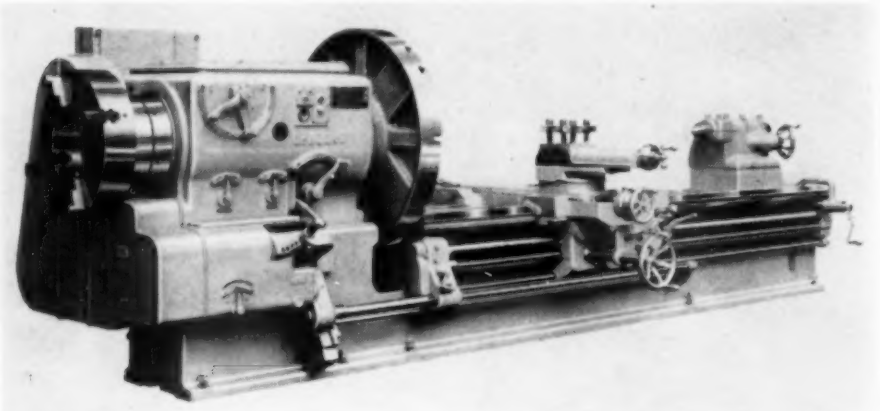
Adapter for Milling Machines

A Rotary Adapter for milling machines—the Harding, by Greenville Tool and Die Co., Greenville, Mich.—is designed for quickly changing tools in milling machine operations.



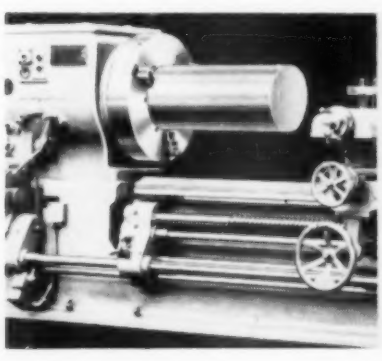
Tools are ejected by simply tapping the release button located on the face of the adapter, the ejection being accomplished by built-in hydraulic force. Otherwise, the design is conventional and the unit will hold any tool having a Morse taper shank. At present, the standard holders are manufactured in both No. 40 and No. 50 NMTB tapers and are guaranteed by the maker for a period of one year. **T-6-33**

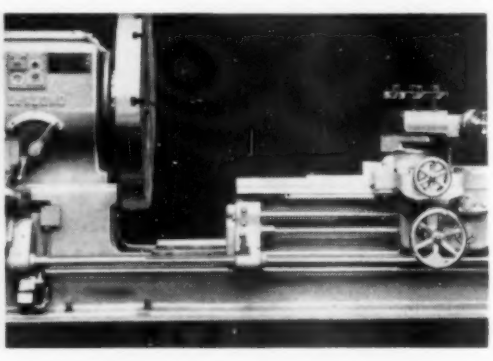
Sliding Gap Bed and Hollow Spindle Lathe



Two established LeBlond lathes—the 25/50 in. Sliding Bed Gap and the 27 in. Hollow Spindle—have been combined into one machine with a swing capacity of 60½ in. within a 5-foot-wide gap and a spindle hole of 12½ in. The machine provides the productive capacity of three lathes: sliding bed gap, hollow spindle, and standard heavy duty engine lathes.

Detachable levers are provided for easily moving the tailstock and the upper bed, and standard accessories and attachments are available for broadening further the productive capacity of the lathe. Condensed specifications are as follows: Swing over bed and carriage wings, 33½ in.; swing over gap, 60½ in.; distance between centers—base length bed—closed, 8 ft. 0 in.; distance between centers—base length bed—extended, 13 ft. 0 in.; spindle hole size 12½ in. Number spindle speeds, 12, with standard range 5-213 rpm; and range with 2-speed motor 2½-213 rpm; rpm 2½—213; motor recommended 25/12½ hp. 1200/600 rpm. Further information available from The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. **T-6-34**





Among improvements included are a totally enclosed, automatically lubricated quick change box, a geared headstock with heat treated steel gears; a carriage which permits facing full swing of the gap; hardened and ground steel bed ways front and rear on upper bed. Large bore chucks can be fitted to both ends of the hollow spindle, and face plates may be mounted on the flange-type spindle nose.

Precision Boring Machine

A precision Boring Machine, by Covel Manufacturing Co., Benton Harbor, Mich., is designed for accurate, high-production boring, turning and facing operations. Electro-hydraulic controls permit instant selection of any one of three automatic cycles with convenient inching for setting up. Complete specifications of the machine, which is available in several models of both single and double-end types, may be had from the company on request. **T-6-35**

Air-Hammer Attachment

The "Hamer-Dril", by the Dril-Hamer Company, Box 158, Planetarium Station, New York 24, N. Y., is an adapter for converting the rotary motion of an electric drill into hammering action for drilling holes in ceramic materials, and also for moderately heavy hammering.

To use, chuck the attachment into an electric drill, hold it solidly against the work but so that the bit may turn slowly in the hole to prevent jamming. Fully described in a circular, available on request. **T-6-36**

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T-6-12	T-6-13	T-6-14	T-6-15	T-6-16	T-6-17	T-6-18	T-6-19	T-6-20	T-6-21	T-6-22
T-6-23	T-6-24	T-6-25	T-6-26	T-6-27	T-6-28	T-6-29	T-6-30	T-6-31	T-6-32	T-6-33
T-6-34	T-6-35	T-6-36	T-6-37	T-6-38	T-6-39					

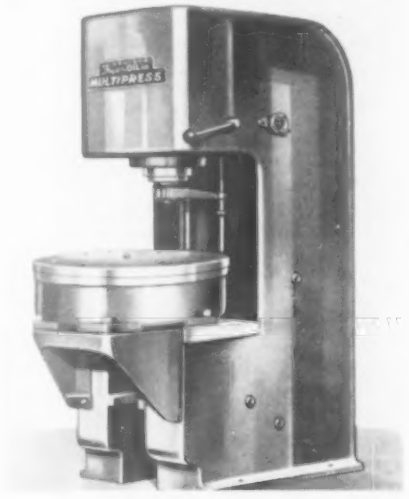
Name..... Position.....

Firm .....

Street..... City, State.....

Oil-Hydraulic Presses

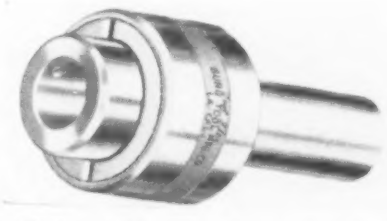
The Denison Engineering Co., Columbus, Ohio, announces a standardized Multipress line of oil-hydraulic equipment for operations on production-run and problem jobs requiring pressing capacities from 1 to 35 tons. This line now provides a flexible range of complete, self-contained presses said to match any of a wide variety of industrial requirements. The presses are now available in seven standard sizes of compact, space-saving frames, each of which is designed for specific dimensional and tonnage requirements.



Three groups of elements, interchangeable to a degree, make up the major operating components within the Multipress oil-hydraulic press frames and offer a choice of combinations for varying ram speed and control. These units include: the hydraulic power assemblies, cylinder and ram assemblies of several sizes, and control valves of as many as ten different types. Full information concerning these presses may be had by writing the manufacturer on company letterhead. **T-6-37**

Close-center Tap Holder

Burg Tool Manufacturing Co., 3743 Durango Ave., Los Angeles 34, Calif., announces what is claimed to be an ideal Tap Holder for close-center multiple tapping operations.



Designed for tapping up to 10-24 in. steel at $\frac{7}{8}$ in. center to center, this addition to the "Tool-flex" line incorporates a neoprene mounting to compensate for misalignment and to prevent bell-mouthed and torn threads, as well as to prevent tap breakage. The tool is self-centering, features short overhang and may be had in shanks to customer specification. **T-6-38**

Form and Cut-Off Machine

The Producto Machine Company, Bridgeport, Conn., announces the Bar-Matic, a 4-spindle machine designed for high speed production of external forming, grooving, beveling, chamfering and cutting-off of bar stock.

The bar feed arrangement features the use of low air pressure for rapidly feeding four 12 ft. bars simultaneously to four adjustable positive stops. Four sets of forming and cut-off tools are mounted on a horizontal slide which is cam-operated longitudinally.

Complete parts, formed and cut off, are said to be produced at a rate of 1400 to 2400 pieces per hour. Capacity in diameter is $\frac{5}{8}$ in. max. with cut-off length to $6\frac{5}{8}$ in. **T-6-39**

North East West South IN INDUSTRY

J. H. Tredinnick, manager of the Hastings, Mich., plant of **E. W. Bliss Co.**, has been named a vice president of the company, it has been announced. Mr. Tredinnick joined Bliss in 1935 to take charge of this plant, which specializes in the manufacture of small and medium punch presses and high production presses.

J. H. Tredinnick

Jack W. Crawford

Jack W. Crawford has been appointed manager of the newly created distributor sales division of **Firth Sterling Steel and Carbide Corp.**, it has been announced. The appointment marks a planned expansion of distributor sales.

Allied Products Corp., Detroit, will soon move its Victor-Peninsular division, where its cold-forged parts and high-carbon cap screws are produced, into a new plant on a 14-acre plot on Burt Rd., it has been announced. The plant will occupy approximately 125,000 sq ft, of which about 16,000 sq ft will be required for the general offices of the corporation.

Three additional members of the board of directors of **The Lincoln Electric Co.**, Cleveland, have been announced by the company. They include **G. F. Clipsham**, assistant to the president; **William Irrgang**, director of plant engineering; and **L. K. Stringham**, director of welding development.

Arthur J. Fausek, president of Modern Engineering Co., St. Louis, Mo., has been elected president of the **International Acetylene Association** at the annual meeting of the organization held recently. **C. E. Monlux**, vice president of The Linde Air Products Co., was elected vice president of the group; **E. V. David**, assistant manager of the technical sales division, Air Reduction Sales Co., was re-elected treasurer. **H. F. Reinhard** was re-elected secretary.

W. G. Arnold has been appointed works manager of **General Electric's** Fitchburg, Mass., works, it has been announced. Responsibility for all works services and allied functions formerly assigned to the Lynn River works has been transferred to the Fitchburg works and, in addition, Mr. Arnold will retain his present responsibilities as manager of manufacturing for the turbine and welding divisions located at Fitchburg.

Victor Ladetto has been appointed sales manager, and **Donald H. Sleeper** assistant sales manager of **Continental Screw Co.**, New Bedford, Mass. Mr. Ladetto was formerly assistant to the vice president and director of sales, and Mr. Sleeper has been associated with the company's sales department.

James G. Gunderson, formerly purchasing agent, has been appointed sales engineer for **Federal Products Corp.**, Providence, R. I. At the same time **Harlan E. Gilson, Jr.**, who has been assistant purchasing agent, will move up to replace Mr. Gunderson.

American Drill Bushing Co., Los Angeles 21, Cal., announces the opening of its new offices and manufacturing plant at 1608 Essex St. In addition to increased production facilities, the plant provides storage space for maintaining complete stocks of bushings for immediate delivery.

Motch and Merryweather Machinery Co. has announced the opening of a modern building at 1350 East 222nd St., Cleveland, which will provide office facilities and warehouse space, in addition to a fully equipped rebuilding shop.

United States Rubber Co. announces a 175,000 sq ft warehouse for the Chicago district, located at S. Pulaski Rd. and 42nd St. Construction was expected to reach completion during May.

Ohio Stainless and Commercial Steel Co., Cleveland, has announced the opening of a Detroit branch warehouse. Located at 6970 West Jefferson Ave., the warehouse will carry a complete line of cold-finished and hot-rolled bars, both carbon and alloy, in addition to carbon sheet, cast iron and brass.

F. H. Boor, formerly chief engineer of the **Fairfield Manufacturing Co.**, Lafayette, Ind., has announced the opening of a gear engineering office in Lafayette.

At an open house attracting several thousand visitors, **The Thompson Grinder Co.**, Springfield, Ohio formally announced two new grinding machines, including the Hydrail surface grinder

Some of the visitors attracted by the open house held recently at Thompson Grinder Co. are shown above inspecting a portion of the plant.

and the Truformatic contour grinder. Christian Baldenhofer, president of Thompson, announced also that the gathering was the occasion for honoring of all 20-year-or-more employees of the company.

The **Baker Industrial Truck** division of **The Baker-Raulang Co.** announces that it has moved its general offices to 1250 West 80th St., Cleveland 2. The manufacturing offices, presently at the West 25th St. plant, will be moved to the new location in the near future.

Correction

Orrin B. Werntz, who was recently appointed managing director of the **Pressed Metal Institute**, as announced in *The Tool Engineer* for April, remains as executive secretary of the **National Screw Machine Products Association.**

OBITUARIES

Floyd F. Oplinger, manager of electroplating service and development of **E. I. Du Pont's** electrochemicals department, died recently after a short illness. Mr. Oplinger has held a number of positions with Du Pont's electroplating departments since 1933.

Eben J. Fullam, chairman of the board of **The Fellows Gear Shaper Co.**, died recently at his winter home in Mount Dora, Fla. Mr. Fullam became associated with the company in 1898 and has served as an officer of the company since 1899, when he was elected treasurer.

Eben J. Fullam

C. Neal Barney

C. Neal Barney, vice president, secretary and general counsel of **Worthington Pump and Machinery Co.**, died recently at his home. Mr. Barney joined Worthington as chief counsel and secretary in 1918, was appointed secretary-treasurer in 1932, and was elected vice president and secretary in 1942.

A Guide to Significant Books and Pamphlets of interest to Tool Engineers

PRACTICAL CONSIDERATIONS IN DIE CASTING

DESIGN, published by the New Jersey Zinc Co., 160 Front St., New York 7, N. Y. Illustrated; 246 pp. Price $3.00.

From the standpoint of including helpful illustrations profusely and tying in these illustrations with the text, this volume is excellent.

Subjects covered include section thickness; part intricacy in relation to good design; employment of ribs, fins, beads and bosses in the casting; how to design for proper coring. The use of undercuts is discussed; a section is devoted to fillets and edges; designing of wheels, gears and cams for die casting is covered.

The chapter on fastening has as its subhead "Elements that are integrally cast usually add little or nothing to the cost of die or per piece produced, but often greatly simplify assembly and lower its cost with net gain in overall economy." There follows a practical discussion on planning castings with integral elements cast in to facilitate fastening at reasonable cost.

Other sections deal with inserts and their effect on die casting design; the effect of design on flash removal costs; piercing and forming possibilities; the influence of design on polishing costs; and planning for decorative features and lettering.

INTRODUCTION TO ATOMIC PHYSICS

INTRODUCTION TO ATOMIC PHYSICS, by Otto Oldenburg, professor of physics, Harvard University. Published by the McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. Illustrated; 373 pp. Price $5.00.

Designed as a text and admirably suited for personal reading, *Introduction to Atomic Physics* presupposes a first-year general course in physics, but only in a few cases is a resort to advanced mathematics necessary to provide an evaluation of the ability of the theory to account for observations.

Emphasis is placed throughout the book on understanding as opposed to accepting on evidence. The text stresses the relation between theory and observed facts, and thus the reader is led to understand how the detailed theory of atomic structure is based on experimental evidence.

Beginning with the structure of matter as revealed by chemistry, the book continues into a discussion of the gases: effects of pressure and temperature; mean free path and viscosity; the nature and mass of atoms as related to

GOOD READING

their measurements on gases. The structure of electricity and its laws are covered, followed by the structure of light and the photoelectric effect.

Detailed treatment is given to the electronic structure of the atom, including its discovery, nature of the spectrum, review of past theories and Bohr's theory. The book continues with further effects of and the laws governing light; concludes the section on atomic structure with a chapter on the properties of X-rays, and their uses.

Of particular interest are later sections on isotopes, natural and artificial transmutation, radioactivity and the cosmic rays. The wave nature of matter, including the diffraction of electrons and a report on wave mechanics precedes a highly useful appendix.

STEEL PLATES AND THEIR FABRICATION, edited by Lionel S. Marks, Gordon McKay, professor of mechanical engineering, emeritus, Harvard University. Published by Lukens Steel Co., 123 Highway Bldg., Coatesville, Pa.; 408 pp. Price $5.00.

A reference book for engineers and designers, this manual contains extensive information on the selection of steel plates best suited to particular projects; data on the properties of carbon and low alloy steels, with charts and tables showing their behavior under sustained and repeated loadings, and their resistance to abrasion, corrosion and temperatures.

Historical data on open hearth steelmaking, welding, the effects of plate width on fabrication costs are included, as well as material on forming, flanging, pressing, flame-cutting and pressure vessels and tanks. More than 100 pages are devoted to general engineering information, including mathematical tables, tables of conversion and other material of frequent reference. Approximately 375 charts, photos and drawings of steel-making and fabrication operations are reproduced.

TOOL MANUAL on carbide tools, published by the Carboloy Co., Inc., Detroit 32, Mich. Paper bound; 190 pp. Available gratis to supervisory personnel.

One of the most comprehensive manuals released on single-point carbide tools is this Carboloy book, recently published after three years' preparation. Intended to answer any question on carbides, the manual is divided into ten sections, and is arranged in a modified slide-film format, utilizing both text and pictures. Over 700 illustrations are included.

A complete index with cross-reference is set up in the front of the book, in question-and-answer form, and offers carbide users the answers to over 3000 questions on design, application, grinding, maintenance and trouble shooting pertaining to carbide tools.

The ten sections of the manual include: tool design, chip breaker design, grade and speed selection, brazing, tool grinding, chip breaker grinding, tool control and method selection, application of tools, trouble shooting and the inspection of tools.

HISTORY OF THE TOOLS DIVISION, WAR PRODUCTION BOARD, by Bradley Stoughton. Published by the McGraw-Hill Publishing Co., 330 West 42nd St., New York 18, N. Y. 154 pp. Price $4.00.

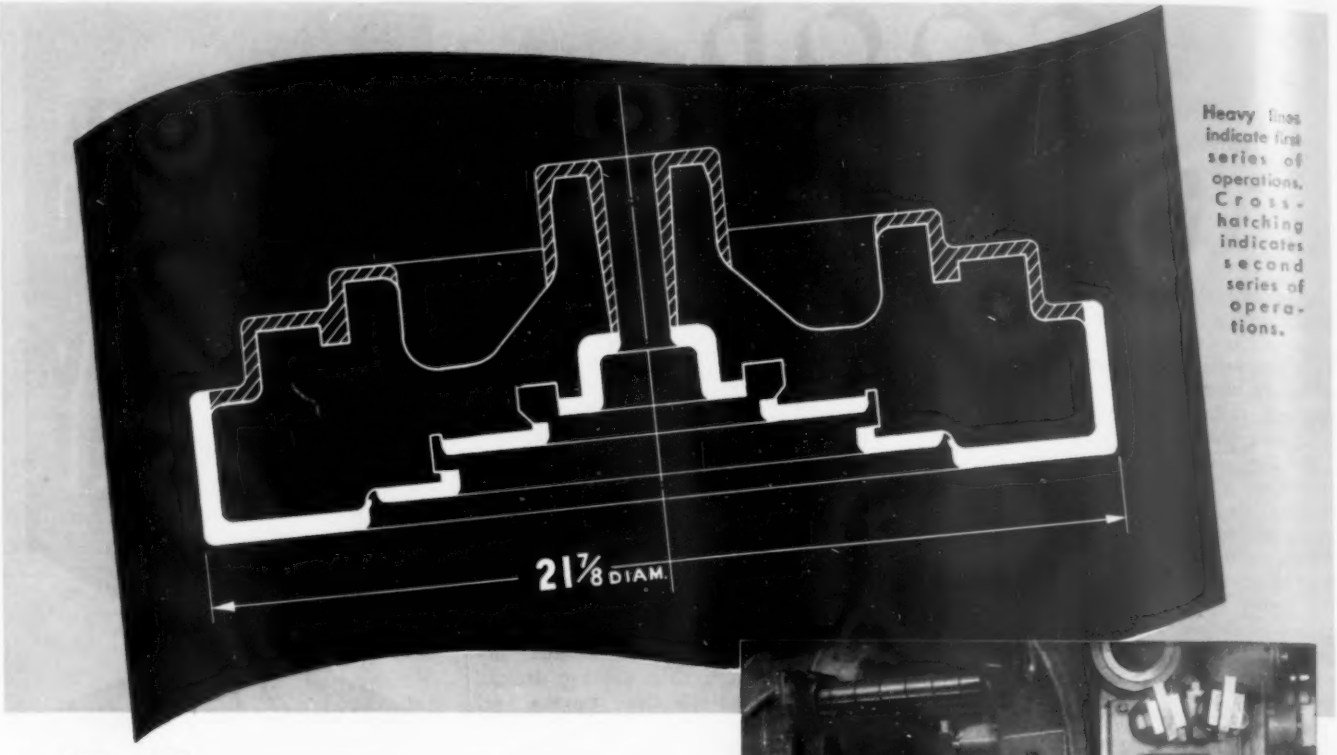
Of particular interest to anyone concerned with or on the Board during its wartime service, this book is written for and about the men from industry who took part in this giant operation. It is an intimate history of the Tools division, one of the first and for a considerable part of the time the largest division of the WPB.

Included in the book and among those whose contributions made the volume possible are manufacturers of machine tools and accessories, forging machines, cranes, gages, heat treating equipment, foundry equipment, abrasive products, bearings and others.

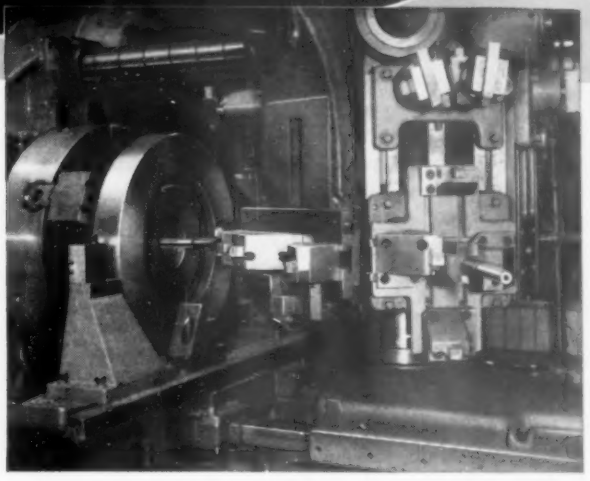
One of the most important sections of the book— and concurring with other authorities who were in Washington during the war —is devoted to concrete suggestions for more efficient organization in the event of another emergency.

DEVELOPMENT OF THE METAL CASTINGS INDUSTRY, by Bruce L. Simpson. Published by the American Foundrymen's Society, 222 West Adams St., Chicago.

Profusely illustrated with more than 200 photos and drawings, this book pictorially traces the development of the metal castings industry—personalities as well as methods. Recently the book was selected on the basis of design and printing as one of the "Fifty Books of the Year" by the Institute of Graphic Arts.



Heavy lines indicate first series of operations. Cross-hatching indicates second series of operations.



32 OPERATIONS ON TWO P&J AUTOMATICS IN 17.05 MINUTES WITH P&J TOOLING

P&J tool engineers have the extensive background of experience to recommend the most economical Automatic Turret Lathe — plus the most effective tooling — for any job — especially for one that calls for a series of intricate chucking operations. Witness this heavy duty flywheel job: one operator, running two Automatics, machines the first series of operations (heavy lines in the drawing) in 17.05 minutes, and the second series (cross-hatched lines) in 12.20 minutes — delivering a finished piece every 17.05 minutes. How else would you, *could* you, do this work so efficiently? Send prints or sample parts for a P&J estimate.

1st SERIES OF OPERATIONS — HUB END TO SPINDLE

1st TF — Rough turn dia. Rough bore 2 dias. . . . Broadface bottom. Broadface dia. . . . Spade clutch face for slide tool.

2nd TF — Rough face web. Rough face open end.

3rd TF — Finish bore 2 dias. Finish face 2 surfaces... Finish turn. Finish broadface. Chamfer.

4th TF — Finish face web.

5th TF — Size bore 2 dias.

2nd SERIES OF OPERATIONS — FINISHED END TO SPINDLE

1st TF — Breakdown taper bore. Turn hub. Bore dia.

2nd TF — Rough face at rim. Rough face dia. Rough face hub.

3rd TF — Rough ream taper hole.

4th TF — Semi finish ream taper hole. Finish turn hub. Finish face at rim. Break corners.

5th TF — Finish ream taper hole. Finish face hub.

6th TF — Size turn hub.

6 DSE AUTOMATIC TURRET LATHE

Potter & Johnston Company

Pawtucket, R. I.

subsidiary of Pratt & Whitney Division Niles-Bement-Pond Company

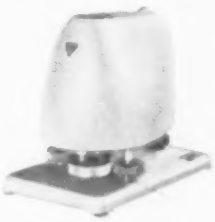
P&J

LOWER COSTS OF PRODUCTION OF INSPECTION

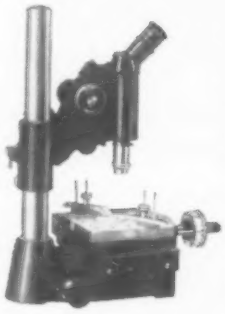
WITH THESE
BAUSCH & LOMB PRECISION INSTRUMENTS

New PARA-PLANE GAGES

Now you can have "laboratory" accuracy of 0.000001" in the determination of flatness and parallelism of reflecting surfaces . . . with production-line *simplicity* and *speed*. So simple that an unskilled operator can make measurements after a few minutes of instruction. Since the master flat *never* comes into contact with the work, it is not necessary to have special operator skill, care and absolute cleanliness of master flats and objects. And, these sturdy instruments permit you to determine accurately the flatness of *recessed* surfaces, and other types of surfaces, which formerly were difficult or impossible to measure.



Two sizes of Para-Plane Gages are available—the larger (right) tests objects up to 6" in diameter; the smaller (left) tests objects up to 3" in diameter. *Bulletin D-224.*



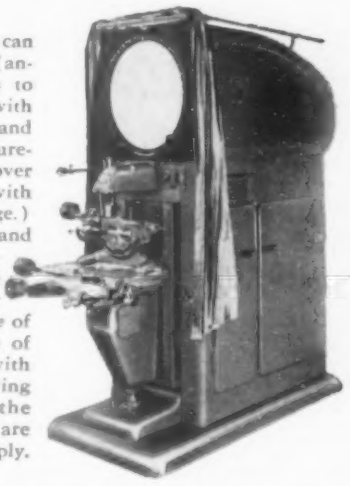
TOOLMAKERS' MICROSCOPE

Linear measurements to ±.0001", and, when fitted with a protractor eyepiece, angular measurements to ± 1 minute of arc, can be made with this sturdy microscope. Operation is extremely *simple* and *fast*. Opaque and transparent objects of any contour can be measured. *Catalog D-22.*

New STEREOSCOPIC WIDE FIELD MICROSCOPES

Provide clear, sharp, three-dimentional, unreversed, magnified images. Used extensively in industry for greater speed and accuracy in small parts assembly operations, inspection of tools and finished parts, and precision curacy in small parts assembly different models for many uses. *Catalog. D-15.*

CONTOUR MEASURING PROJECTOR



No other projector can match its accuracy (angular measurements to ± 1 minute of arc with a protractor screen, and direct linear measurements to ±.0001" over a range of 4"x6" with the cross slide stage.) Dimensions, angles, and profiles of production-run parts can be compared directly with a *traced outline* of the projected image of the master part, or with a large scale drawing superimposed on the screen. Inaccuracies are found quickly...simply.

WRITE for complete information on these five important optical aids designed to help you save time and money. You may be paying many times over their cost in lost time and rejects. Send your request to Bausch & Lomb Optical Company, 763-F St. Paul Street, Rochester 2, New York.

BAUSCH & LOMB
OPTICAL COMPANY ROCHESTER 2, N.Y.

Cost per Cut REDUCED more than 2/3

with MOTCH & MERRYWEATHER CARBIDE-TIPPED BLADES

Segmental type carbide-tipped blade in diameters of 11" to 28". Arbor size to fit your application.

Solid type carbide-tipped blade in diameters up to 18". Furnished with even spacing or special grouping of teeth.

They Stay Sharp Longer!

Motch & Merryweather extends its line of saw blades by adding carbide-tipped and cast-alloy-tipped segmental (11" to 28" diameter) and solid (up to 18" diameter) types. Both types can be furnished with the well known Triple-Chip grind or any special grind required by your job —in the one right grade of carbide for superlative results... M. & M. *tipped* blades wear longer. Fewer resharpenings; more cuts per grind. Superb finishes minimize secondary finishing operations. Savings in time and money are evident from the start. *Our technical staff will be glad to study your exact requirements.*

TRIPLE-CHIP GRIND
for the sawing of non-ferrous metals, such as aluminum, manganese bronze, copper and magnesium, as well as ferrous milling applications of various descriptions.

SPECIAL GRIND
for sawing phenolic and acrylic plastics, resinoid-impregnated materials, plywoods, asbestos-base, rubber-base and many other kinds of non-ferrous materials.

CUT SAWING COST OVER 2/3!

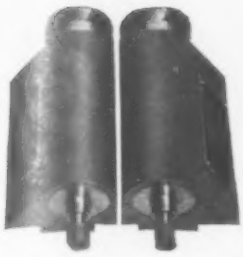
M. & M. Carbide-Tipped Blade, 1350 cuts per grind. 10 grinds give 13,500 cuts; 4.5¢ per cut.

Conventional Steel Blade, 75 cuts per grind. 10 grinds give 750 cuts, or 14.5¢ per cut.

Ask for Bulletin 230-T.

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING • CLEVELAND 13, OHIO

AT YOUR COMMAND • AN UNPARALLELED EXPERIENCE IN CIRCULAR SAWING



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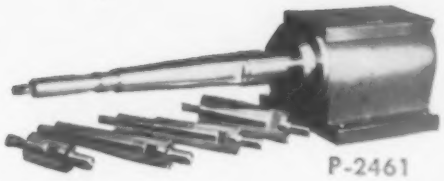


P-2461

P-32T

POPE
PRECISION SPINDLES

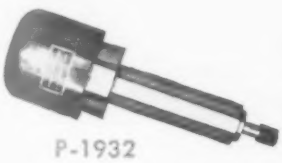
Out of these and dozens of others — skilfully engineered, *precision* built, with *sealed-in lubrication* — you will find the motorized or belt driven Spindles that will produce better work and more of it from your machines.

Name the Spindle number or describe the application and we'll mail you complete specifications and estimates.

P-1461

P-2500

P-2463



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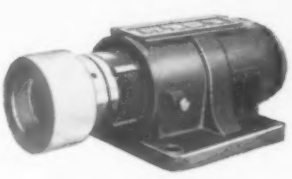

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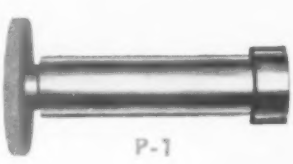

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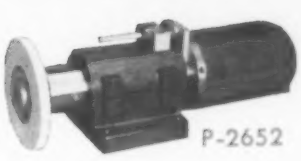

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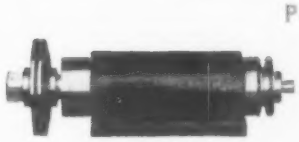

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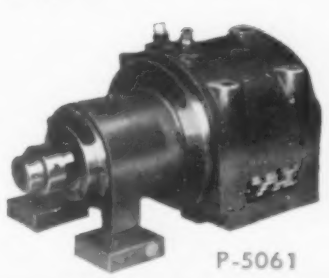


P-5061

No. 61

POPE

TRADE MARK REG. U.S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

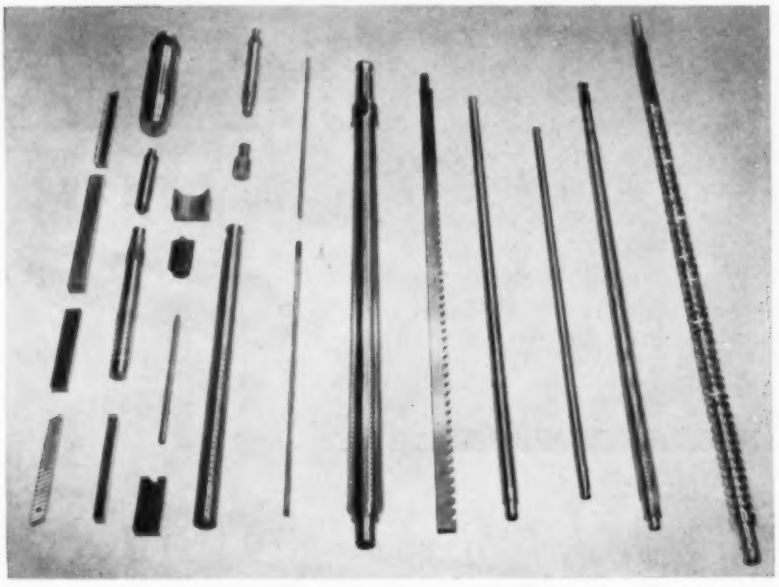
261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

BECAUSE *American* ENGINEERS ALL 3 { BROACHES / FIXTURES / BROACHING MACHINES

American BROACHES SERVE YOU BETTER

Higher production at lower cost . . . on most metal cutting jobs . . . that's the big advantage in broaching. But, getting the full benefits of broaching requires broaches, fixtures and machines designed for efficient production. Because of 30 years' experience, American Broach can engineer and build a tool, or a complete unit, that will do your job best.



Keyway, spline, involute spline, surface, rotor-kut, serration, combination or burnishing — every type of broach can be engineered and built by American

take broaches for example

American makes every type of broach for internal or surface broaching, in a shop modernly equipped for the utmost production economy. They manufacture them to a consistent standard of quality ... users know the performance to expect from *American* broaches. The exacting production standards of *American* combined with the engineering and manufacturing "know-how" produces precision built broaches, and before release to a customer, each broach is rigidly inspected for guaranteed satisfaction.

As a result of this care in manufacturing, *American* broaches have proven in use that they give maximum serviceable life . . . produce more parts per sharpening . . . can be counted upon for the finest results in production.

Is there, in your plant, an operation where lowered costs and increased production would be an advantage? Send a sample part or print plus hourly requirements for the recommendations of American engineers. Please address inquiries to Department T.

AN ECONOMY TIP FOR BROACH USERS

Get an extra broach or two with your first order. The cost per broach will be lower and you will avoid unnecessary delay while sharpening.

WRITE FOR BROACHING BOOKLETS

We'll be glad to send you descriptive circulars to help answer your broaching questions. Circular 144M covers broaches and contains much valuable information. Circular 700M describes the American line of push and pull heads. Others on American machines may be obtained.

AMERICAN *American* BROACH & MACHINE CO.

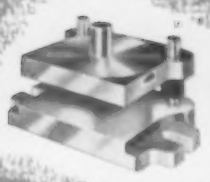
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

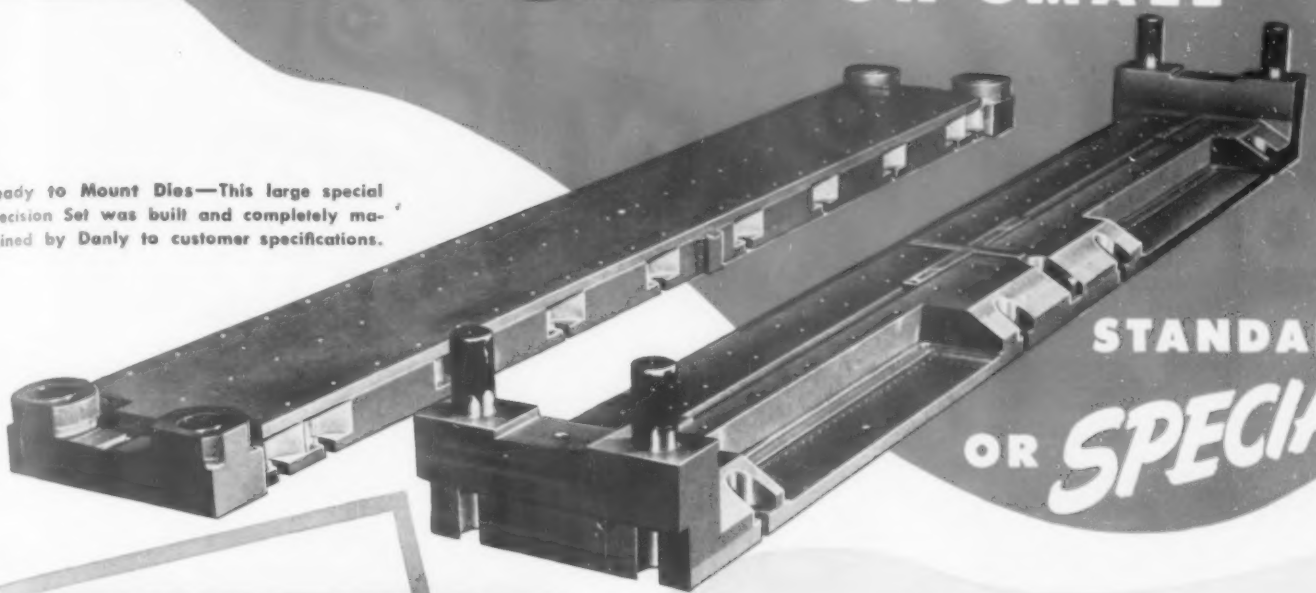
SUNDSTRAND MACHINE TOOL CO. S ROCKFORD ILLINOIS U.S.A.

LARGE OR SMALL



Danly Precision Die Set—One of several thousand combinations available in standard sizes.

Ready to Mount Dies—This large special Precision Set was built and completely machined by Danly to customer specifications.



STANDARD OR SPECIAL

save time { USE DANLY NATION-WIDE DIE SET ASSEMBLY SERVICE

Danly Assembly Plants (marked with stars) are stocked with interchangeable parts for immediate assembly and quick delivery of standard die sets to your specifications.

- **Chicago 50,** 2100 S. 52nd Ave.
- **Cleveland 14,** 1550 E. 33rd St.
- **Dayton 2,** 990 E. Monument Ave.
- **Detroit 16,** 1549 Temple Ave.
- **Grand Rapids,** 113 Michigan St., N.W.
- **Long Island City 1,** 47-28 37th St.
- **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
- **Milwaukee 2,** 111 E. Wisconsin Ave.
- **Philadelphia 44,** 18 W. Chelten Ave.
- **Rochester 4,** 16 Commercial St.

WRITE FOR THIS *Free* BULLETIN

Get more details on how you can more effectively use Danly's machining service for special die sets to save additional time and money. Write for free bulletins.

DANLY *Precision* DIE SETS

ARE BUILT FOR ALL TYPES OF PRESS OPERATIONS

The Precision Die Sets above are typical of the wide range of steel and semi-steel types built by Danly to serve every need of the stamping industry. The small set is one of the several thousand combinations in standardized sizes which are available and stocked as cataloged items. The unusually large set is a special on which more than 600 drilling, reaming, tapping, boring, milling and planing operations were performed. The set is completely machined ready for mounting dies.

Danly Special Machining Facilities Help Speed Die Deliveries

Danly's complete machining and handling equipment is available for any required work on die sets of any size or shape. The necessary machining for mounting dies can be handled efficiently at the time the die set is produced. This special machining by Danly saves time for tool rooms and die shops, and helps speed die deliveries. It permits devoting die making equipment and personnel exclusively to die work. Perhaps you can use this type of service on your next job. Ask for special quotations.

DANLY MACHINE SPECIALTIES, INC.

2100 SOUTH 52nd AVENUE • CHICAGO 50, ILLINOIS

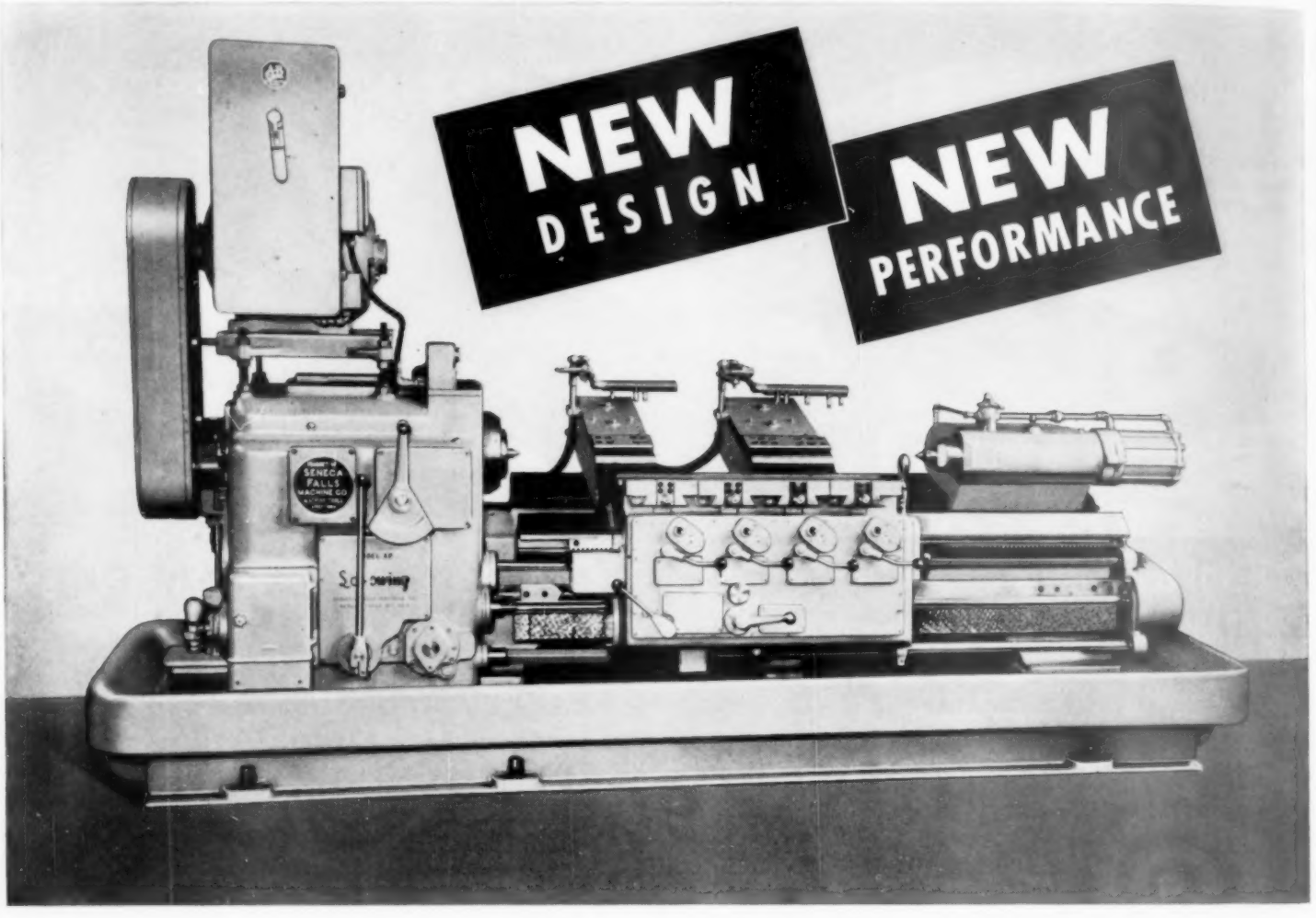
DANLY

OVER 25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

PRECISION DIE SETS . . . STANDARD AND SPECIAL

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK



NEW *Lo-swing* LATHE OFFERS UNLIMITED CARRIAGE TRAVEL FOR LONG OR SHORT CUTS

Model AP, Lo-swing's new Semi-Automatic Lathe is designed to fill the demand for a modern, high-speed, multiple-tool turning lathe, which can be set up readily and operated by unskilled labor, and in which maximum carriage travel is provided. It is ideal for shaft work involving long shoulder lengths where overlapping of cuts is not desirable, and equally suited to short run jobs requiring heavy stock removal where limited quantities do not justify set-up time on fully-automatic, closed-cycle machines.

Model AP is rugged in design and heavily constructed throughout to take full advantage of the tremendous cutting capacity of modern sintered carbide tools at high cutting speeds and coarse feeds. Its carriage travel is limited only by bed length and is accomplished through a unique balanced, twin-pinion carriage feed mechanism which cuts the unit pressure on rack and pinion teeth in half. Carriage cross slides are power operated and individually controlled. Hinged-type roller steady rests prevent the work from springing away from the tools. Other features include: Automatic feed throwout coupled with Automatic tool relief; Rapid traverse movements for longitudinal carriage feed and cross slides and for the Automatic Back Attachment.

Investigate the cost-cutting possibilities of the newest Lo-swing Lathe. Write for Bulletin AP-49 today.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH *Lo-swing*

MORE GEARS IN LESS TIME!

With

BARBER-COLMAN

"MULTITHREAD" HOBS

JOB FACTS

Operation—Finish Hob 12/14 Pitch Gears, 8 per load.
Machine—Barber-Colman No. 16-16.
Hob—Barber-Colman Ground "Multithread" Hobs.
Material—Steel forgings.
Feed—.054"/rev. of work Speed—139 RPM
Fl-to-Fl—60 minutes per load.
Accuracy—Roll with master gear. Kickout within .002".

Finish, production, tool life — all 3 have improved with a changeover to Barber-Colman *"Multithread"* hobs on this finish hobbing operation. The use of *"Multithreads"* depends on machine conditions and the particular characteristics of the gears to be cut. Under the proper conditions, as in this case, more gears are produced in less time, with substantial production savings. This job, for example, shows 25% better finish, 24 more gears per hob setting, 10 more settings per sharpening, and production time cut from 95 to 60 minutes per load.

We are anxious to demonstrate what *"Multithreads"* can do for other production hobbing jobs, and we invite questions and job specifications. Ask your Barber-Colman representatives for an analysis of *"Multithreads"* on your jobs.

METHODS ENGINEERS!

Get this free data on hob performance and accuracy, a complete case history record, without obligation. Send request on company letterhead for File No. 3424.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 3424 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

SUPERFINISH STARTS - OR STOPS - AT SCRATCH!

Perhaps you've thought of Superfinish only in terms of ultra-smooth surfaces. Not always! Here's one where the process has been stopped—controlled at a surface roughness of 10 micro inches. Note, in this magnification, how the abrasive grits have moved in paths which never duplicate, leaving a crosshatch pattern. For certain applications, such partially Superfinished surfaces have two distinct advantages: (1) removal of the soft "smear metal" left by grinding heat, (2) the crosshatch pattern maintains uniform distribution of lubricant to discourage spalling.

Superfinish has many other interesting applications. Write on your letterhead for the booklet, "Wear and Surface Finish."

GISHOLT
MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUNDTABLE
represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcome here.

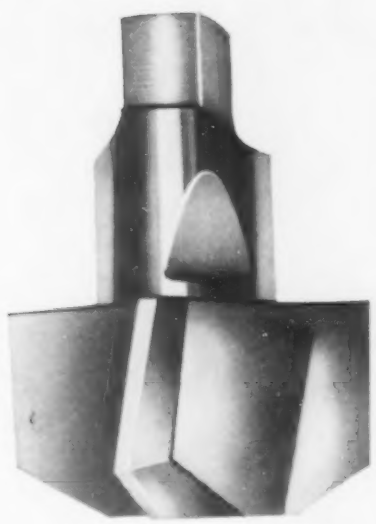
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

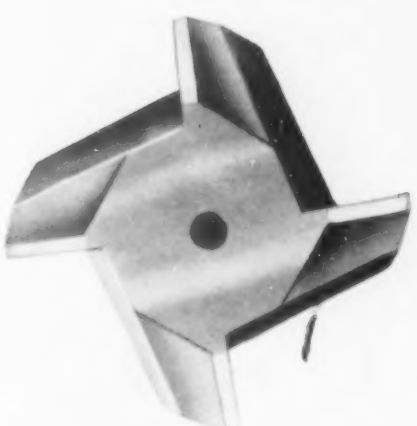
100% MORE FEED

when enlarging holes with . . .

S-J SCULLY-JONES *New*

CORE DRILL CUTTER





100% more feed because four flutes are cutting instead of two. Also, this New Cutter removes approximately 45% of its diameter. Result — less time per operation.

Cut tooling costs on set-ups for enlarging holes, where guide bushings are not used. Only 4 Drivers are required for the 25 S-J Core Drill Cutters.

Rigidity is assured by the short body of the Driver. This eliminates one of the causes of chatter.

Use these S-J four-fluted Core Drill Cutters and Drivers in

- radial drills
- engine lathes
- turret lathes
- boring mills
- and similar machines

SEND FOR NEW DESCRIPTIVE BULLETIN containing prices and specifications.

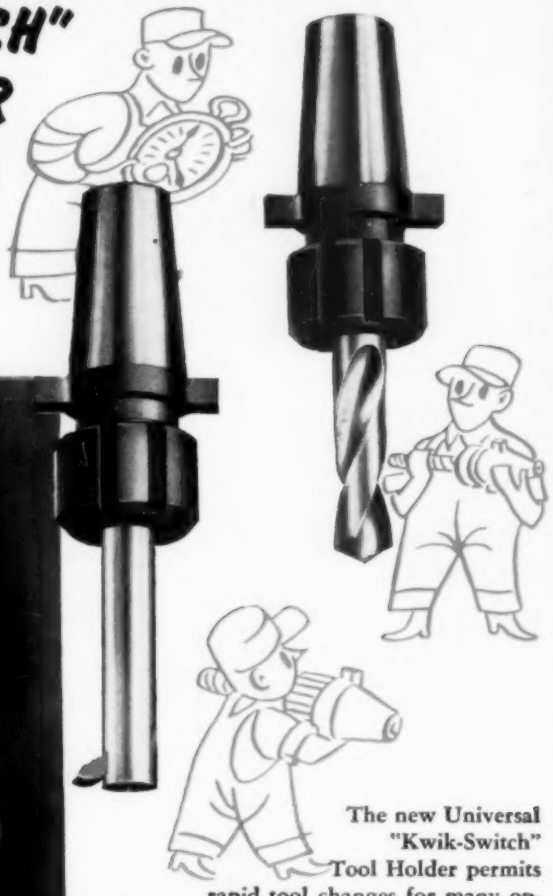
Scully-Jones AND COMPANY

1915 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

NEW INGENIOUS UNIVERSAL "KWIK-SWITCH" TOOL HOLDER

permits 10-second tool changes without accuracy losses



The new Universal "Kwik-Switch" Tool Holder permits rapid tool changes for many operations, such as drilling, reaming, and boring on mills, radial drills, and other machines and still maintains accuracy and rigidity not ordinarily found in tools of this type. The Universal "Kwik-Switch" Tool Holder consists of a Master Chuck and several Adapter Chucks. Each tool is inserted in its Adapter Chuck and set to proper length and tightened. The Adapter Chuck is then easily locked or unlocked by hand in the Master Chuck by less than a half turn of the locking nut. Tools are thus interchanged in a fraction of the time ordinarily required in similar operations. Precision manufacture throughout insures the accuracy of the "Kwik-Switch" Tool Holder. It is made of hardened and ground steel and held to the same exacting standards which have made the Universal Collet Chuck a favorite of industry. Universal "Kwik-Switch" Tool Holders handle tools with either straight or taper shanks. The Master Chuck is available in straight and taper shanks to fit all standard machine tools. Send for complete information.

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 3, MICHIGAN

Facilities available for special hardened and ground precision parts made to customer specifications.

OTHER UNIVERSAL PRODUCTION TOOLS

THERE IS A DIFFERENCE IN TAPS, TOO!

All taps may look alike at first glance but the superior quality of BATH taps is proved by their efficient performance. Ground from the solid AFTER hardening, BATH taps have a uniform thread structure that is strong and accurate.

Today, with production costs so important, more plants are specifying quality BATH taps for greater speed on the job . . . for more holes per tap and for longer runs between sharpenings.

Regular stock types and sizes are available — or if you need taps of a special size or for working different materials, you'll find BATH representatives highly resourceful and BATH engineers widely experienced in unusual threading problems. Write, giving complete details . . . we'll be glad to tell you how to get the lowest cost per tapped hole.

INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED

28 Grafton St., Worcester, Mass.

Automatic Grinding OF LARGE CASTINGS in 1/7th OF THE TIME!

NEW No. 936 Vertical Spindle BESLY Rotary Surface Grinder

Per-piece grinding time cut from 96 to 13 minutes, a 7-fold improvement — Automatic operation for savings on costly expert labor — Modern design to cut maintenance — A minimum of pre-setting!

These are the spotlighted results achieved by this new Besly grinder, now used by a Texas company in grinding gates for high pressure oil lines. Tests show this grinder equally efficient on fifth wheel castings, small gas engine bases, fluid drive transmission housings and many other types of work.

Here again, Besly experience in grinder design, engineering and manufacture has served to produce *improved* grinding in less time and at *lower* cost. Beating high costs today on production grinding means modern grinding equipment, built by experts to meet your specific needs.

When you call on Besly you get the benefit of more than 50 years accumulated experience — the kind of help that means more production profit at lower cost on grinding.

CHECK THESE PRODUCTION BOOSTING, MONEY-SAVING FEATURES OF THE No. 936

- **Vertical, Single Spindle** — using 42" diameter abrasive ring above a rotating table.
- **Entire Spindle Assembly** — raised or lowered by feed screw.
- **Quick, Easy Loading Table** — slotted for secure holding of work with bolts. Operates at any speed from 1 to 6¼ RPM.
- **Automatic Operation** — after table is loaded and controls adjusted.
- **Pendant Control Box** — within easy reach of operator.
- **Motors, Bearings, Cylinders** — all designed to operate at highest efficiency with minimum power and maintenance requirements.

TITAN WHEELS

Here's a valuable source of information on modern grinding wheels and abrasives with all the facts on Besly Titan Steelbacs to save "down time." Write for your copy today!

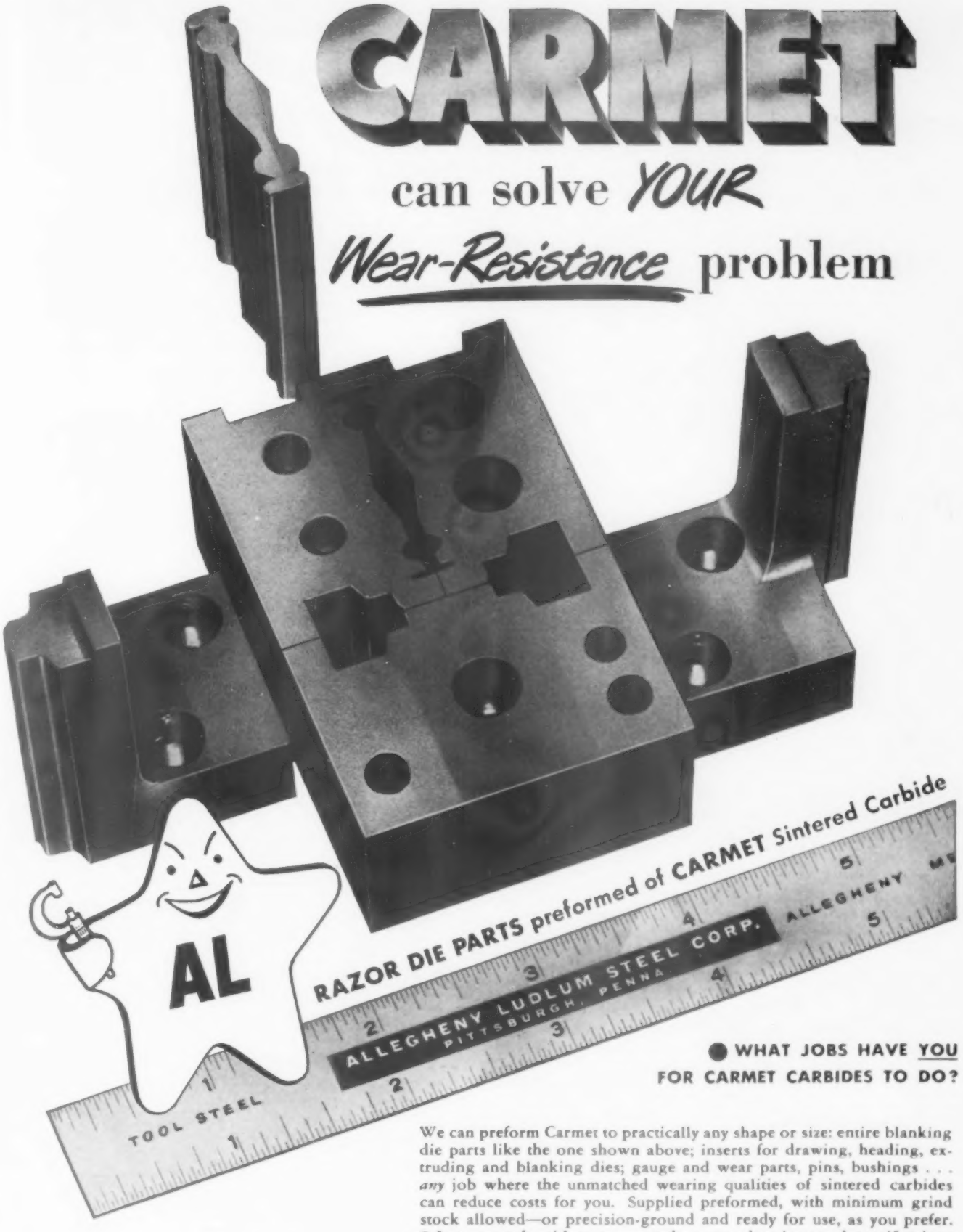
Maybe GRINDING is the Better Way . . . Better Check with **BESLY**

BESLY GRINDERS AND ACCESSORIES
BESLY TAPS • BESLY TITAN ABRASIVE WHEELS

CHARLES H. BESLY AND COMPANY • 118-124 N. Clinton St., Chicago 6, Ill. • Factory: Beloit, Wis.

CARMET

can solve *YOUR* *Wear-Resistance* problem



● **WHAT JOBS HAVE YOU FOR CARMET CARBIDES TO DO?**

We can preform Carmet to practically any shape or size: entire blanking die parts like the one shown above; inserts for drawing, heading, extruding and blanking dies; gauge and wear parts, pins, bushings . . . *any* job where the unmatched wearing qualities of sintered carbides can reduce costs for you. Supplied preformed, with minimum grind stock allowed—or precision-ground and ready for use, as you prefer. ● Let us work with you . . . send us your drawings and specifications for quotations.

Allegheny Ludlum Steel Corporation

CARBIDE ALLOYS DIVISION, Detroit 20, Michigan

Distributors: Write us about handling CARMET Standard Tools in your area. WAD 2418

	Machinability	Hobability	Core Strength	Wear Resistance	Distortion in Hardening	Pressure and Temperature
DURAMOLD C water-hardening, hobbing	POOR	BEST	POOR	GOOD	FAIR	LOW to MEDIUM
DURAMOLD B oil-hardening, hobbing	POOR	BEST	FAIR	GOOD	GOOD	LOW to MEDIUM
DURAMOLD A air-hardening, hobbing	*POOR	†GOOD	GOOD	GOOD	BEST	MEDIUM to HIGH
MULTIMOLD for machined molds, heat-treated or carburized	BEST	FAIR	FAIR	**FAIR	FAIR	MEDIUM
BTR oil-hardening, for machined molds	GOOD	FAIR	GOOD	GOOD	GOOD	HIGH
A-H5 air-hardening, for machined molds	FAIR	POOR	BEST	GOOD	BEST	HIGH

* Best, when annealed for machining
† Fair, when annealed for machining
** Good, when carburized and hardened

START WITH THE RIGHT MOLD STEEL

In selecting tool steel for plastic molds the first step is to answer these questions:

- Is the mold to be cold-hobbed or machined?
- Is high wear-resistance important? Short or long runs?
- What core-strength is required?
- How much distortion in heat-treatment is permissible?
- High or low operating temperatures? How much pressure?

As a further aid in making the best choice, refer to the chart above. This is a general guide to six of our popular mold steels. Each is scrupulously inspected to assure the sound, clean surface and properly-annealed structure necessary for highly-polished cavities.

A Bethlehem metallurgist is ready to assist you with the selection of tool steel . . . or to recommend its proper heat-treatment. Plan now to get full details on Bethlehem Tool Steels. There's a Bethlehem sales office or tool-steel distributor near you. Or write us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM TOOL STEEL

For the First Time! Electronic on

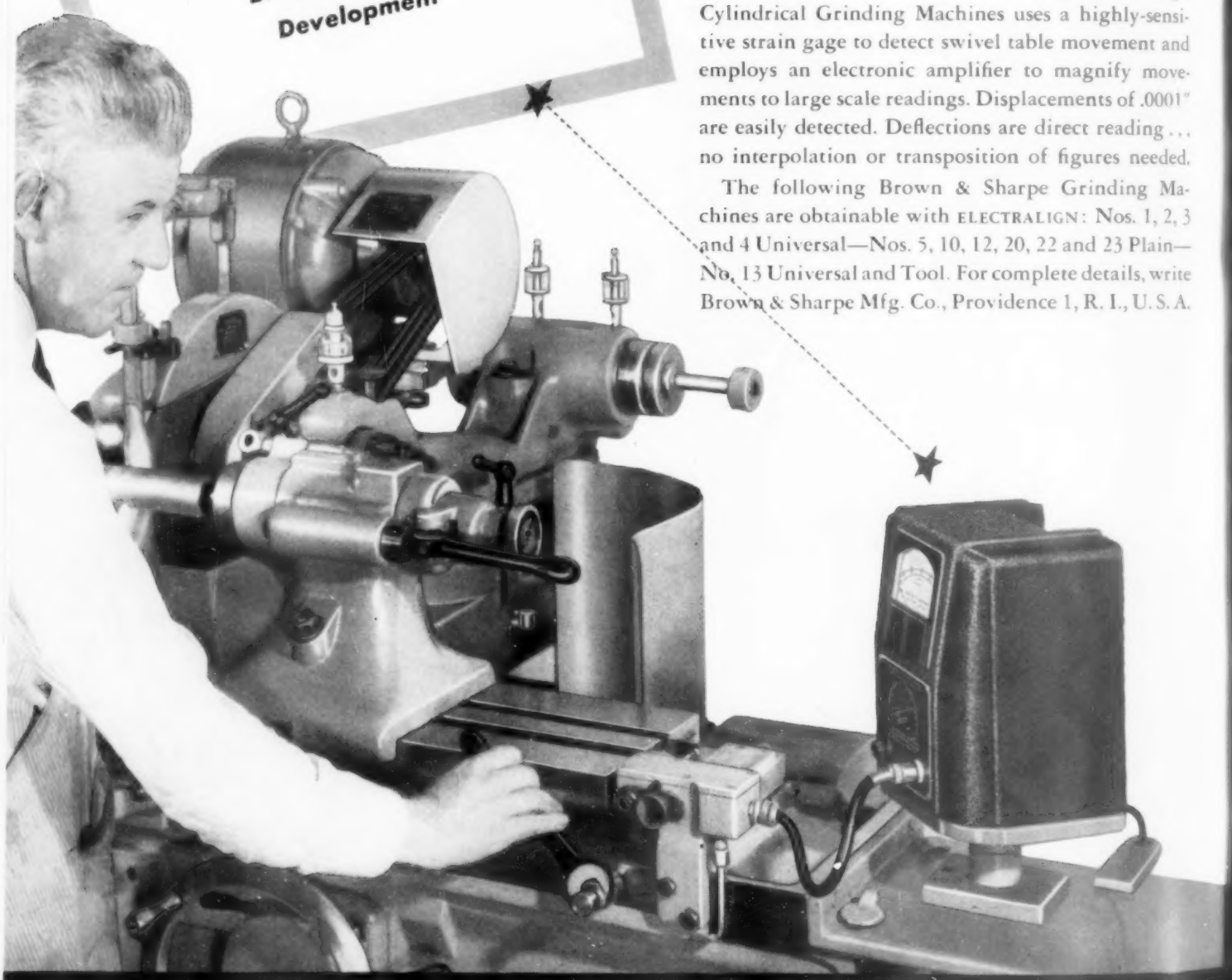
ELECTRALIGN

Exclusive New Brown & Sharpe Development

Here is a unique aid that permits grinding machine operators to accurately align a swivel table for straight or tapered work after only *one* preliminary grind. ELECTRALIGN, designed to transfer operator's skill to a function of the machine, eliminates costly time-consuming, cut-and-try operations. It does much to eliminate spoiled work, particularly where only .002" to .003" is left for finish grinding.

This exclusive arrangement for Brown & Sharpe Cylindrical Grinding Machines uses a highly-sensitive strain gage to detect swivel table movement and employs an electronic amplifier to magnify movements to large scale readings. Displacements of .0001" are easily detected. Deflections are direct reading . . . no interpolation or transposition of figures needed.

The following Brown & Sharpe Grinding Machines are obtainable with ELECTRALIGN: Nos. 1, 2, 3 and 4 Universal—Nos. 5, 10, 12, 20, 22 and 23 Plain—No. 13 Universal and Tool. For complete details, write Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



BROWN &

Alignment of Swivel Table Grinding Machines

ACCURATE SETTING EASILY MADE

The extreme simplicity and reliability in operation of the ELECTRALIGN makes it very practical for shop use. Corrections in swivel table alignment may be made simply and precisely. No need of regrinding several test pieces to obtain proper adjustment.

SET-UP TIME SHARPLY REDUCED

After ELECTRALIGN amplifier pointer has been set to the ten-thousandths desired to swing the work, the operator makes a single, positive correction by moving the table, through its regular adjusting mechanism, until the pointer reads zero. It's done in an instant! This correction can be made during the grinding operation.

EASIER OPERATION FASTER PRODUCTION

On long work ground to close limits, even a slight taper may represent a large part of the allowable tolerance. On this type of work, ELECTRALIGN makes setups easier and more positive . . . makes faster production possible . . . and reduces risk of spoilage. Tapers, too, can be set directly after one preliminary grind . . . and precise settings maintained.

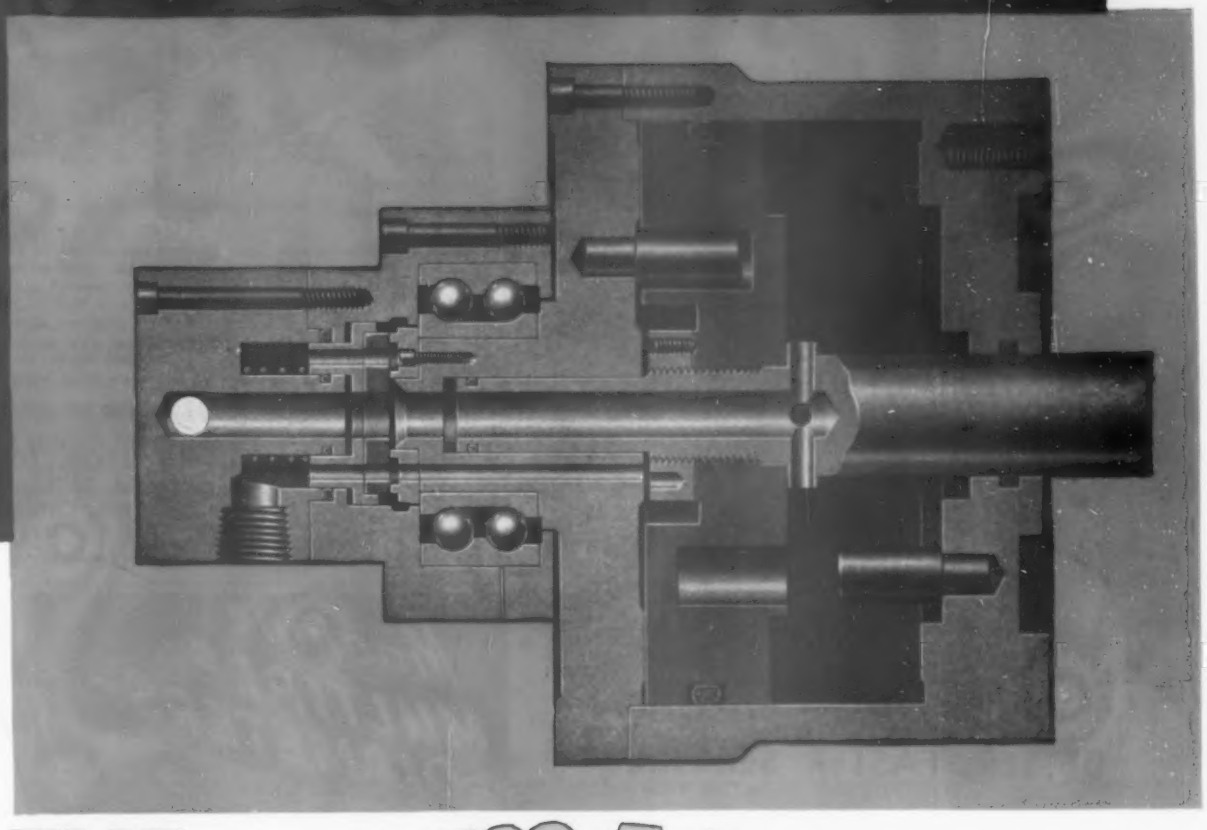
OTHER PRACTICAL ADVANTAGES — ***ELECTRALIGN*** may be supplemented by the Electralign-Comparator Selector when external or internal measurements employing a comparator are made in conjunction with setting the table for alignment. This equipment eliminates differences in measurement due to human "touch or feel" and a wide choice of comparators is possible.

Conveniently located Electralign Amplifier magnifies small angular swivel table movements to large scale readings.

Operator using Electralign-Comparator Selector with a special gage to check measurement of straight work. A wide variety of comparators may be adapted for use with this equipment.

SHARPE B·S

AN IMPORTANT ADVANCE TO MEET TODAY'S DEMAND FOR SPEED IN MACHINING



THE CUSHMAN HIGH SPEED *Aluminum* AIR CYLINDERS

FOR POWER CHUCK OPERATION

Especially developed for advanced machine tool applications . . . guaranteed to operate without pressure loss under heaviest recommended loads and at speeds to 5000 r.p.m.

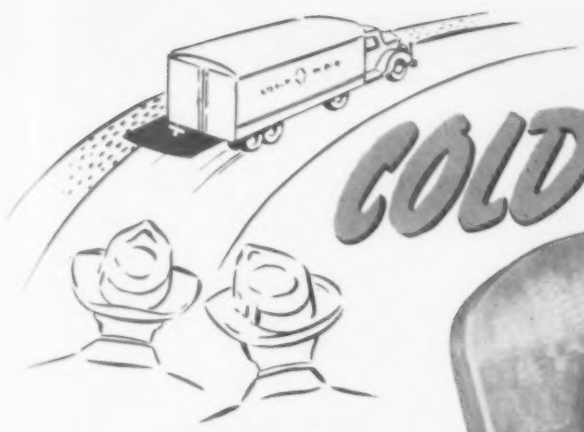
Aluminum alloy forged cylinder bodies finished with lapped bores . . . cylinders statically balanced after assembly, no vibration, low flywheel effect.

Available for use with Cushman or other chucks in 3¼" to 12" sizes. Send for Bulletin.

CUSHMAN also manufactures a complete series of WRENCH OPERATED CHUCKS

Write for Catalog 63 and Bulletins

THE CUSHMAN CHUCK COMPANY, HARTFORD 2, CONN.



COLD RIVETED

no question about

Strength!

YOU know the joint is tight...strong ...SAFE!—when it's COLD RIVETED with a Hannifin *"HY-POWER"* Hydraulic Riveter. Doubts about the effects of vibration, stress fatigue, and embrittlement vanish. Anyone, with little or no experience, can turn out perfect work hour after hour at high rates of production with effortless ease. Faulty workmanship ceases to be a hazard. Let Hannifin help you use this efficient, modern, low cost production method. Recommendations on request.

Right—Cold riveting main members of frame for giant truck trailer in plant of one of America's leading manufacturers.

HANNIFIN *Hy-Power* RIVETERS

Hannifin "HY-POWER" Hydraulic Pressure Generator

LAWN MOWERS TO CAR FRAMES.—Whether you are riveting lawn mower blades or railroad car frames, there is a unit to handle your job better, faster, and cheaper. The Hannifin line is complete. Standard portable yoke riveters from 7½ to 100 tons, or more.

PORTABLE, BALANCED!—Perfectly balanced, easy-moving yokes. Compact, portable, *"HY-POWER"* pressure generators. Simple connections. Units furnished complete. READY TO GO TO WORK.

NOISELESS "HYDRAULIC SQUEEZE" ACTION.—Smooth, fast, precision-controlled power at your finger tip—thanks to Hannifin's *exclusive "HY-POWER"* pressure generator design. No complicated electrical circuits; no relays. All-mechanical positive action. Simple pressure adjustments. SEND FOR COMPLETE INFORMATION.

HANNIFIN CORPORATION

1101 S. Kilbourn Avenue **Chicago 24, Illinois**

AIR CYLINDERS • HYDRAULIC CYLINDERS • HYDRAULIC PRESSES
PNEUMATIC PRESSES • HYDRAULIC RIVETERS • AIR CONTROL VALVES

Nationwide Sales and Service

DoALL's NEW "BURR-PROOF" GAGE BLOCKS

Reg. Trade-mark

COMPARATOR

GAGE BLOCKS

OPTICAL FLATS

INSPECTION INSTRUMENTS

MOBILE UNIT

AUTOMATIC INSPECTION

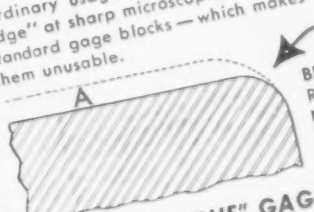
A = METAL REMOVED BY FINAL LAPPING

SHARP EDGE

CONVENTIONAL GAGE BLOCKS

Ordinary usage forms burr or "wire edge" at sharp microscopic edges of standard gage blocks — which makes them unusable.

BLENDED RADIUS NO EDGE



DoALL "BUR-PRUF" GAGE BLOCKS

The Secret of "Re-Rounded" Edges

Now, without added cost, you can have the new DoALL "BUR-PRUF" gage blocks that last twice as long as other standard blocks. Think of the great savings in replacement costs, fewer rejects and better quality products! Developed and used exclusively by DoALL, burr-proofing is the latest major achievement in gage block history. It "re-rounds" the edges of the blocks to prevent formation of microscopic burrs caused by ordinary usage. Burred edges are a major reason for discarding gage blocks — even a burr only 2 millionth inch can make a block unsuitable.

Although gage makers round the edges of the blocks to prevent burrs, the purpose of rounding is defeated by final lapping, which produces unwanted sharp edges. These become burred by the slight shocks and jars of normal handling. Mechanical operations to re-round the edges after lapping are avoided as they invariably cause distortion. Therefore the sharp edges left have been tolerated as a necessary evil — until the new DoALL process that "re-rounds" edges without distortion.

100% LONGER LIFE!

Part of DoALL's Integrated Inspection System

All DoALL gage blocks are burr-proofed. They are the key units of the integrated inspection equipment that DoALL manufactures for industry — from simple and quickly assembled precision gages to fully automatic inspection machines that inspect, count and sort parts at an amazing speed of 3,000 to 12,000 per hour.

FREE LOAN OF SOUND MOVIE FILM

For industrial education groups. 25-minute, 16-mm. Subject: "Gage Blocks and Accessories".

The DoALL Company

Reg. U. S. Pat. Off.

Des Plaines, Illinois

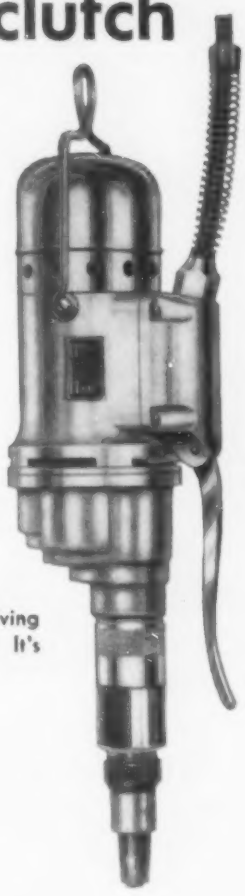
REPRESENTATIVES IN 56 COUNTRIES

DoALL STORES IN KEY CITIES

TO SHOP EXECUTIVES

Write for free copy of "QUALITY CONTROL" a book that covers modern inspection.

Only MILLERS FALLS screw drivers have the ADJUSTOMATIC® clutch



We'd like to see a screw driving problem No. 50 can't solve. It's compact, light, and powerful.

WHAT IT MEANS TO YOU

If you have the problem of getting smoother, faster, more uniform production screw driving . . . then Millers Falls portable electric screw drivers will pay off for you in *results*.

You can solve your problem with a Millers Falls screw driver, because only Millers Falls gives you the patented, super-sensitive "Adjustomatic" clutch.

WHAT THE ADJUSTOMATIC CLUTCH DOES

Gives velvet smooth, vibrationless operation even on assemblies usually considered too delicate for a power driver. So sensitive it delivers the *right* torque for screws from No. 10 down to No. 2. Lengthens the useful life of the tool. Increases assembly and production efficiency and speed, cuts costs.

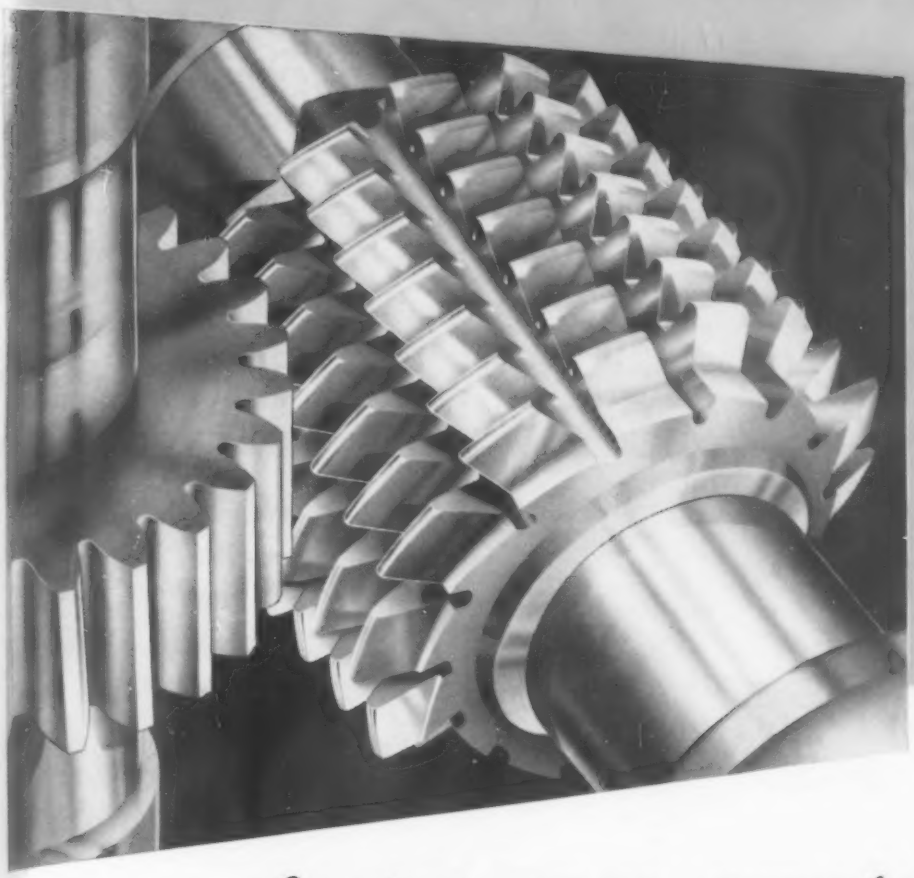
More powerful than ever, the new "Dyno-Mite®" line has no equal in its field.

The two Millers Falls screw drivers illustrated are doing remarkable jobs in many plants . . . not only because of the "Adjustomatic" clutch but also because of other unique features which help workers drive more screws faster and better. Both are available in a number of capacities and speeds.

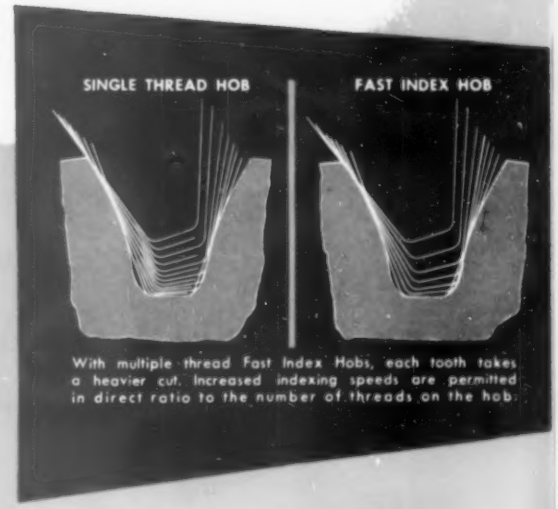
Portable Electric Tools

MILLERS FALLS TOOLS
SINCE 1868

Solve your screw driving problems now. Write for full information and the name of your nearest Millers Falls distributor. He can help you. Millers Falls Company, Greenfield, Mass.



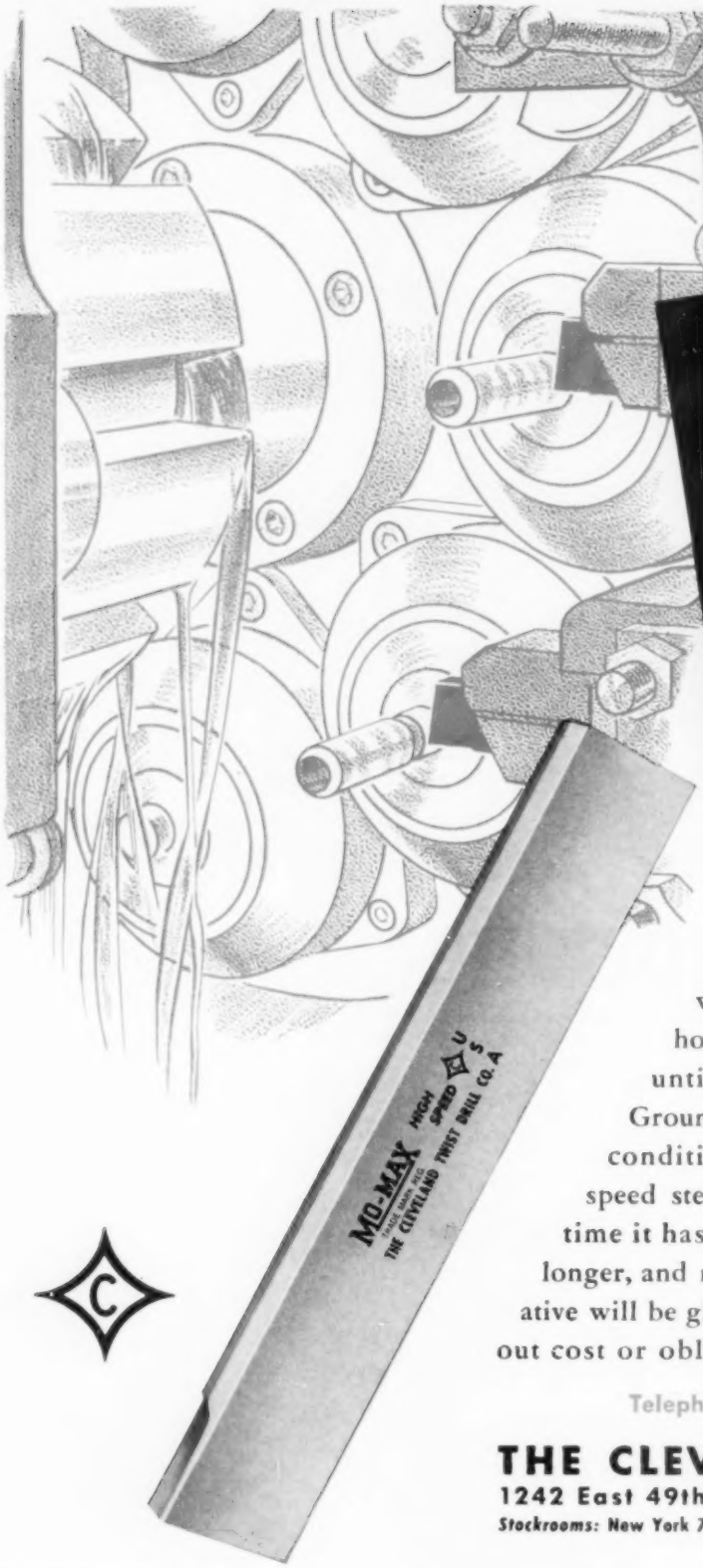
faster gear production...
with FAST INDEX HOBS



Investigate the cost-saving possibilities of Fast Index Hobs by Illinois Tool Works. Where tolerances and finish requirements permit, Fast Index Hobs allow greatly increased indexing speeds and remove more metal with each revolution. They will help you exploit the full production capacity of your present machine tools. Call your Illinois Tool Works field engineer to discuss the application of the new Fast Index Hobs to your work today!

ILLINOIS
TOOL WORKS
2501 North KEELER AVE., CHICAGO 39, ILLINOIS
In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

HEADQUARTERS FOR ENGINEERED CUTTING TOOLS



FOR HIGH SPEED CUT-OFF BLADES... IT'S MO-MAX

TRADE MARK REG. U. S. PAT. OFF.

5 to 3

A machine shop superintendent was satisfied when the cut-off blades on this job lasted 3 hours before regrinding. He was satisfied, that is, until he discovered that MO-MAX High Speed Ground Cut-off Blades lasted 5 *hours* under identical conditions. MO-MAX is a molybdenum high speed steel with superior cutting qualities. Time after time it has proved its ability to cut faster, "stand up" longer, and reduce costs. A *Cleveland* Service Representative will be glad to give a demonstration in *your* plant, without cost or obligation. Ask our nearest Stockroom, or . . .

Telephone Your Industrial Supply Distributor

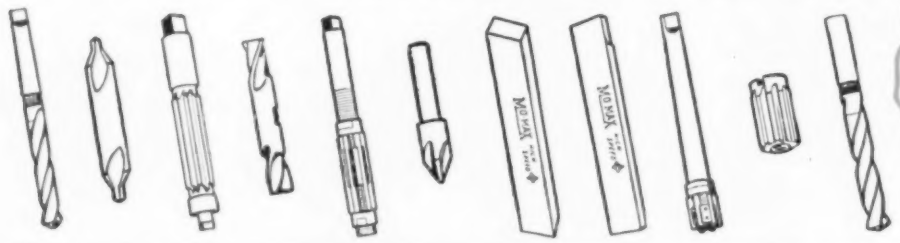
THE CLEVELAND TWIST DRILL CO.

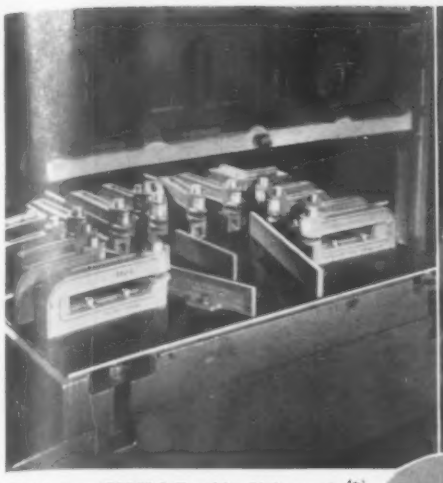
1242 East 49th Street • Cleveland 14, Ohio

***Stockrooms:* New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5 • Los Angeles 11**

E. P. Barrus, Ltd., London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS





WALES Type "BL" Hole Punching Units punch round and shaped holes in flat sheets.

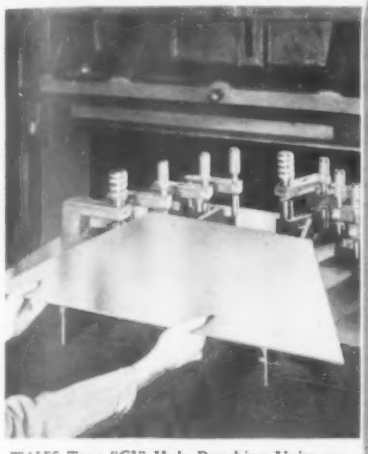
WALES Type "CD" Hole Punching Units punch over the entire area of flat sheets.

WALES Type "C" Hole Punching Units punch angles, channels, extrusions and flat sheets.

WALES

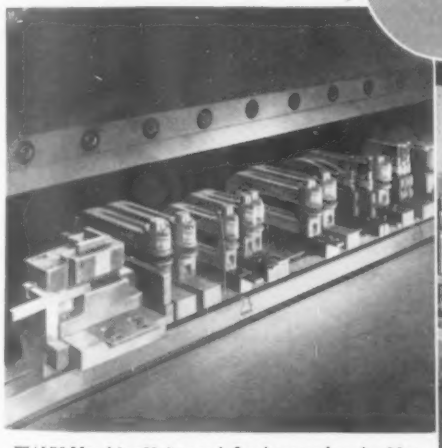
HOLE PUNCHING AND NOTCHING EQUIPMENT

...the most complete line in America

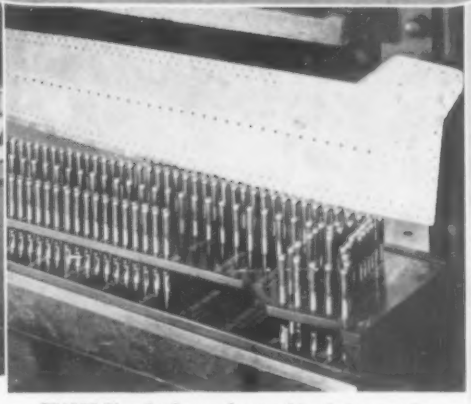


WALES Type "CJ" Hole Punching Units are heavy-duty to punch angles, channels, extrusions and flat sheets up to ¼" thick.

WALES Type "H" Hole Punching Units punch holes horizontally in flanges and rims.



WALES Notching Units notch flat sheets and angles. May be used in setups with Type "BL" Units for punching and notching in same operation.



WALES Plate Set System for punching holes over the entire area of flat sheets.

WALES Strippits strip metal from conventional dies.

The above complete line of hole punching and notching equipment is one reason why so many manufacturers standardize on Wales Units for *long and short production runs.* In fact, many have adopted this standard practice rule:—Before putting holes in angles, channels or sheets by any method, call on Wales-Strippit FIRST.

For the complete story on this stamping press and press brake tooling equipment, write for fully-illustrated catalogs.

WALES-STRIPPIT CORPORATION

GEORGE F. WALES, *President*

393 PAYNE AVENUE, NORTH TONAWANDA, N. Y.

(Between Buffalo and Niagara Falls)

WALES-STRIPPIT OF CANADA, LTD., HAMILTON, ONTARIO

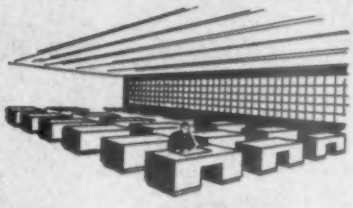
Specialists in Punching and Notching Equipment

Putting Your House in Order?

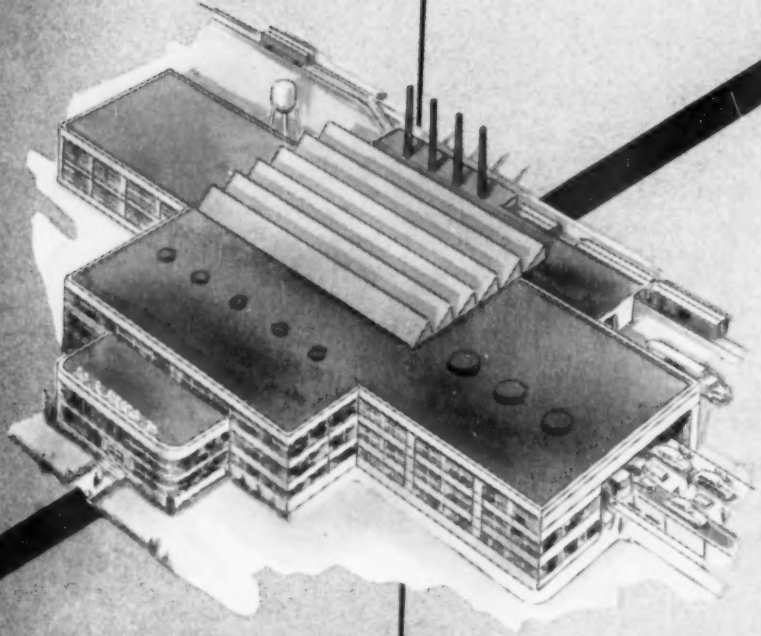
THROUGH

EXPANSION?

CONTRACTION?



Modernization?



PIONEER
HAS
KNOW-HOW
AND
EXPERIENCE

Plants Like Yours Are Using This Staff

INTERNAL ORGANIZATION

Establishment of the framework to execute management's policies; simplification of routines to handle orders, records and reports with minimum paperwork; allocation of responsibility and authority to prevent friction caused by overlapping controls.

PRODUCT DESIGN AND DEVELOPMENT

Realistic comparison drawn between cost of developing and manufacturing a new product and probable realization of returns; existing products redesigned for increased sales appeal by comprehensive analysis of appearance, function and performance.

PRODUCTION METHODS

Study of production sequence to eliminate, combine, change order of, or simplify operations; analysis of basic process and recommendations for machines, tools and accessories to competently balance out production lines.

QUALITY CONTROL

Compilation of accumulative tolerance charts to assure any product meeting established manufacturing limits; correct location of inspection points and setting of standards and procedures to keep scrap at absolute minimum.

TOOL AND SPECIAL MACHINE DESIGN

Design of tools, dies, jigs, fixtures and gages to complement and implement any machine; modern production problems conquered by specially designed machine tools incorporating hydraulic, pneumatic or electronic controls.

TIME AND MOTION STUDY

Determination of quickest and best work sequence with suggested improvements in workplace, methods and tools; study of operators' physical movements to correct bad operating practices, lessen fatigue and increase efficiency.

MATERIAL HANDLING

Unbiased recommendation and selection of equipment best suited to job—whether it be hand trucks, truck tractors, power-lift trucks, stackers, gravity-roll, power or chain conveyors, cranes or hoists.

PLANT LAYOUT

Flexible plant arrangements for steady progression of production obtained through preparation of process flow charts which clearly reveal bottlenecks; charts may be projected into template or scale model layouts for even more detailed study.

PRODUCTION CONTROL

Channeling work through a plant so sales schedules are kept in definite balance with production capacity; machine loads are accurately charted to give assurance that delivery dates can be met.

COST CONTROL

Determination of pertinent cost information, currently accurate, for use as a means of establishing prices and operating efficiency, to guide and guard present conditions and intelligently chart an organization's future course.

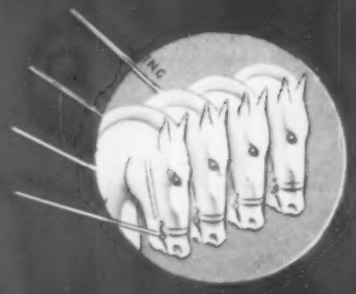
PIONEER ENGINEERING

& MANUFACTURING CO.

Incorporated

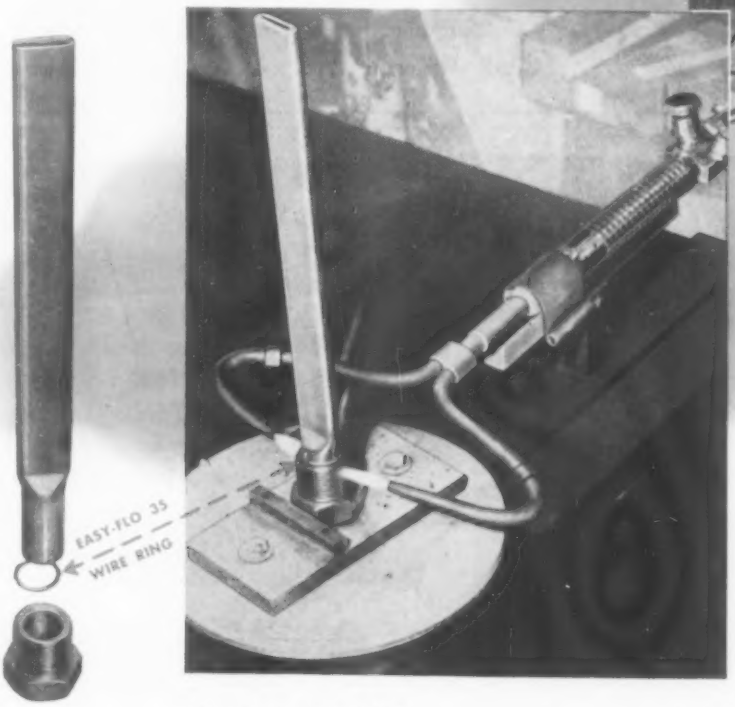
ENGINEERS, DESIGNERS, CONSULTANTS
AND PRODUCTION SPECIALISTS

19669 John R. Street
Detroit 3, Michigan



They STEPPED-UP Production 300% — with EASY-FLO

EASY-FLO makes it simple for an experienced hand with an oxyacetylene torch to turn out a surprising volume of metal joining. It's this silver brazing alloy's combination of low-working temperature, exceptional fluidity and instantaneous penetration that does it. Even so, output can be considerably increased, and torch brazing made so simple that practically anyone can do it. All it takes is a little ingenuity—such as was displayed by the engineers of Knight Rebound Controllers, Ltd., of Hamilton, Ont., when they had to speed up their production of immersion type water heaters. They figured out a simple procedure and a home-made set-up that reduced the actual brazing to a foot pedal proposition and stepped up production 300%. The pictures tell the story.



At far left are the heater parts—a copper tube and brass bushing—and the ring of EASY-FLO 35 wire used to join them. Joint areas of parts are covered with Handy Flux. Then, assembled parts, with the EASY-FLO 35 ring around the tube and resting on the bushing, are placed on turntable between horns of the 2-tipped torch. Operator then steps on pedal which lights torch from a pilot and starts turntable motor. That's all there is to it. Actual brazing time is about 1 minute.

FIND OUT where and how EASY-FLO low-temperature silver alloy brazing can speed up production and cut costs for you. Write today, for Bulletins 12-A and 15.

HANDY & HARMAN

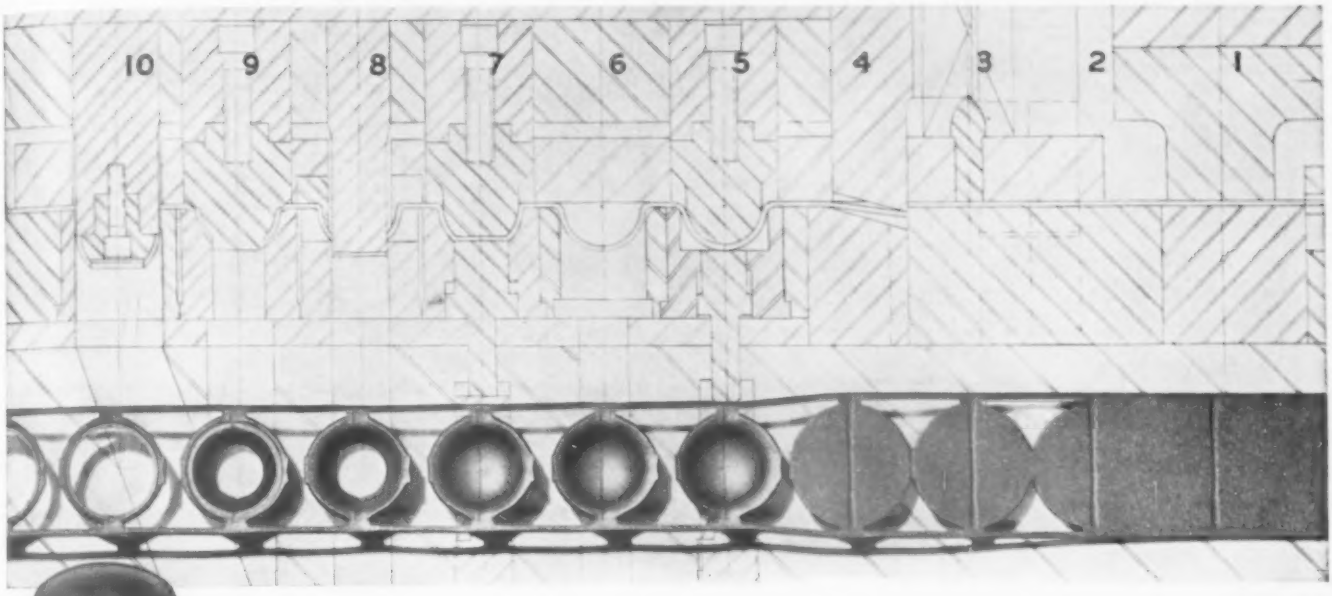
82 FULTON STREET NEW YORK 7, N. Y.

Bridgeport, Conn. • Chicago, Ill. • Los Angeles, Cal. • Providence, R. I. • Toronto, Canada

Agents in Principal Cities

ON WHICH TWO STATIONS

...would you use Carboloy dies?



In many multiple-station operations, one or two stations carry considerably more stress than the others.

On this job, can you tell which stations carry the greatest stress? You might be surprised at the savings made by converting only those stations to Carboloy dies!

You'll often find that major savings and vastly increased production can be effected without changing to carbides on all stations.

In the case above, most of the stress occurs in the first *forming* operation (Station #5) and in the final *cut-out* operation (Station #10). When these had been converted to Carboloy dies, it was found that further conversions weren't needed . . . and savings were tremendous!

In other jobs, switching to carbides on one or two stations can give you temporary relief; you can add more stations later as you find it necessary.

Do you have similar problems? Carboloy's Die Engineering Manual can help you solve them.

SEND THE COUPON FOR YOUR FREE COPY

. . . today

This Carboloy insert at the fifth station—a forming die insert—has been in service for more than a year. It has performed more than 5,000,000 drawing operations, despite the high stress at that point, *without requiring maintenance!*

This Carboloy cutting-out insert (Station #10) only needs resharpening once in every 2,000,000 operations. Steel cut-out dies needed sharpening *ten times oftener* . . . and were good for a total of only 600,000 punches!

FOR GREATER PRODUCTION

SPECIFY

CARBOLOY®

CEMENTED CARBIDE

CARBOLOY COMPANY, INC., 11101 E. 8 Mile Ave., Detroit 32, Mich.

Gentlemen:

Please send me your Die Engineering Manual, D-124. I'd like to take advantage of the savings it describes.

Name_____

Title_____ Company_____

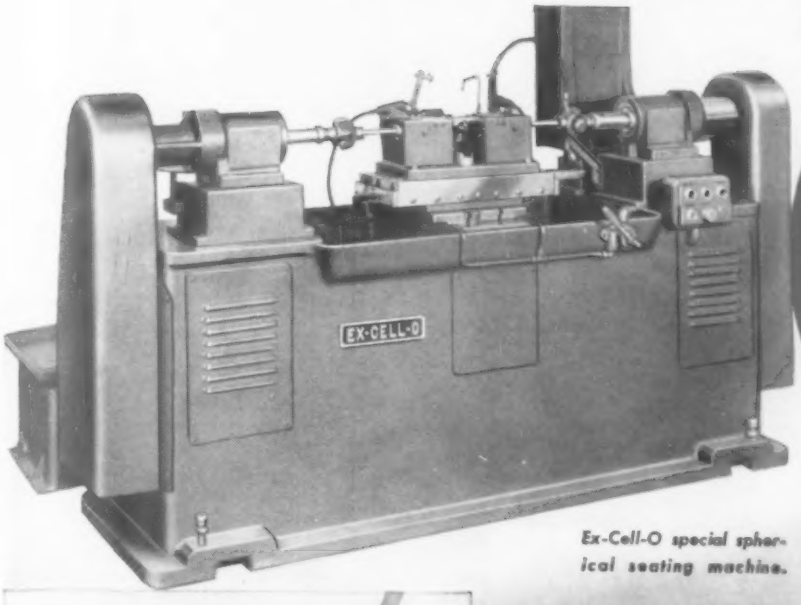
Address_____

City_____ Zone_____ State_____

Index of Tool Engineer Advertisers

JUNE, 1949

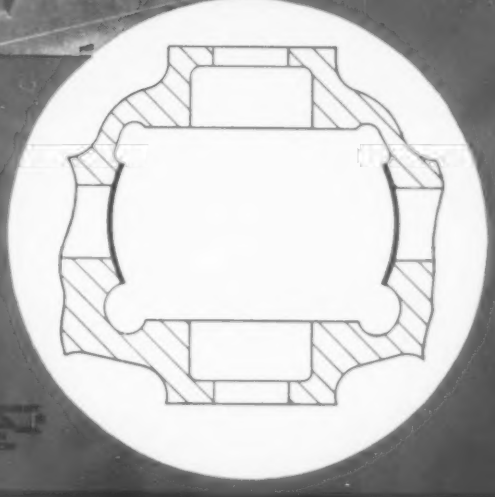
GOT A *Machining Problem?*



Ex-Cell-O special spherical seating machine.

SEE EX-CELL-O

Left: View of work fixture and cutter on Ex-Cell-O special spherical seating machine.



Right: Heavy lines show operation performed on differential cases with Ex-Cell-O special machine.

Ex-Cell-O Machine Eliminates Slow Hand Operation on Difficult Job!

Cutting spherical seats inside automotive differential cases is ordinarily a slow hand operation that is out of place in today's production procedure. An operator working on a drill press loads and clamps the part, runs the tool holder into the work, engages the cutter, then cuts the first seat. This cut completed, he withdraws the tool holder and removes the tool. Then he unloads and reloads or indexes the part and repeats the process for the other seat . . . On the Ex-Cell-O special machine shown here the operator merely loads the part, shifts a valve that controls the clamps and presses a start cycle button. At the completion of the cycle he removes the part . . . that's all the operator does. The machine does the rest!

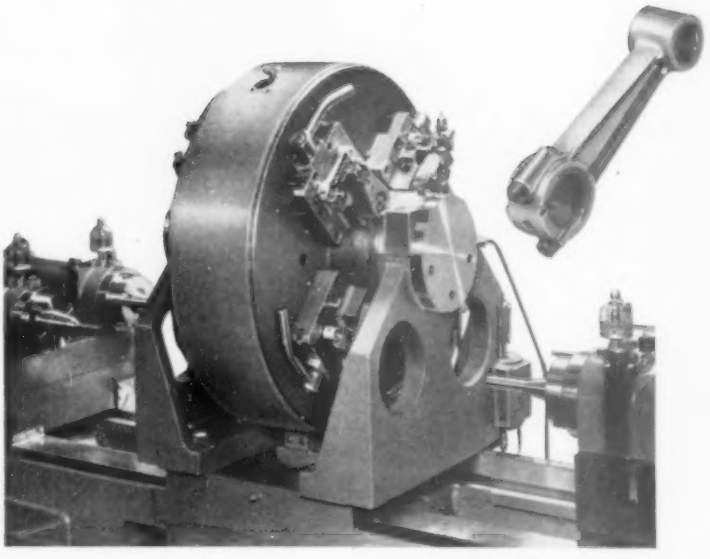
If you have a machining problem, see your nearest Ex-Cell-O representative.

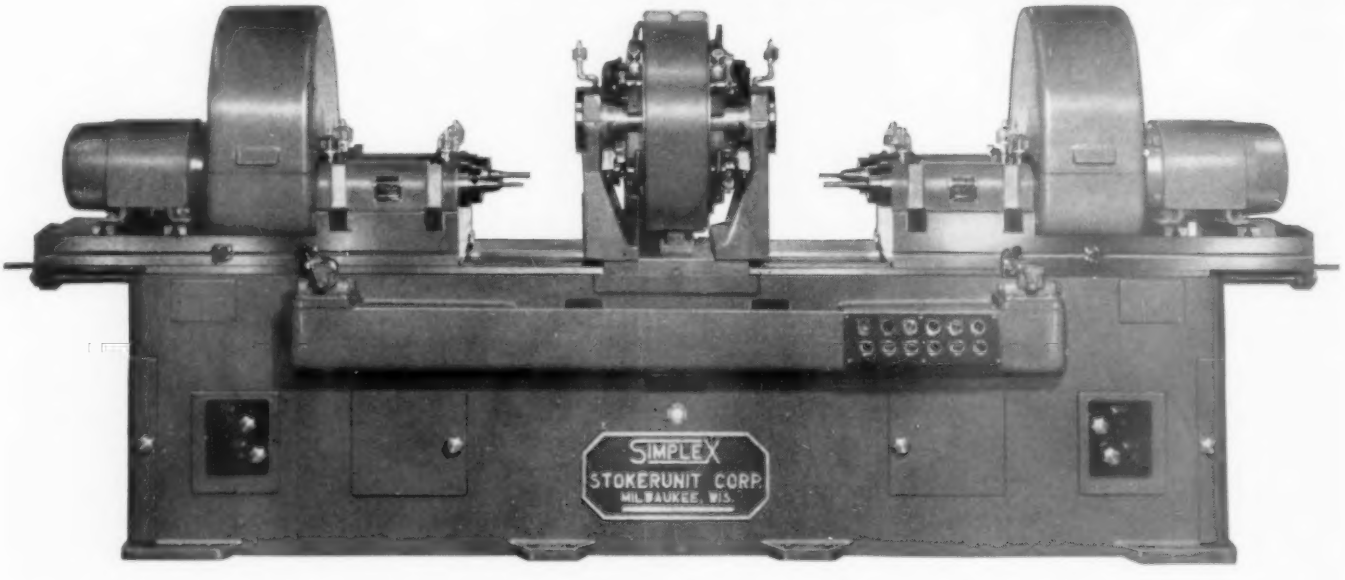
EX-CELL-O CORPORATION DETROIT 32 MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

SIMPLEX

Small high speed gas engines run at speeds unbelievable a few years ago yet with mechanical failures rare due to the increasingly high standard of workmanship on the running parts, but costs must be reduced to reach the volume market. SIMPLEX Precision Boring Machines with SIMPLEX engineered tooling are used for this purpose by many leading manufacturers.





This SIMPLEX 2U 2-way Precision Boring Machine with double-faced automatic indexing trunnion fixture is tooled for semi-finish and finish boring small die cast aluminum connecting rods with bronze inserts. Boring tolerances are plus .0003, minus .0000. Interchangeable fixtures are provided so that several different size rods can be run on one machine. This principle is applicable to many size rods where maximum production and accuracy at low unit cost are required.

Precision Boring Machines

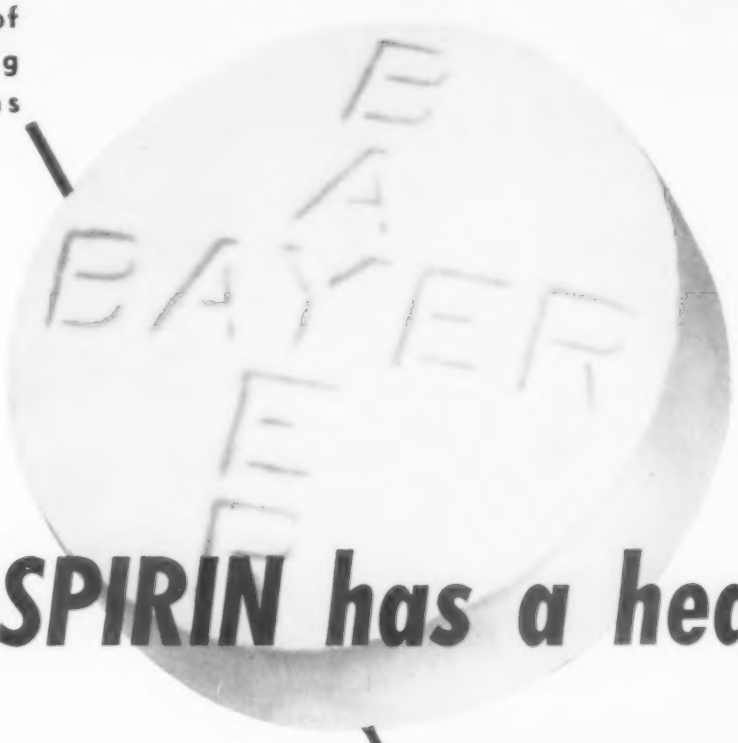
STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4528 West Mitchell Street, Milwaukee 14, Wisconsin

Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

Second in a series of
Unusual Grinding
Wheel Operations



Even ASPIRIN has a headache!

● One of the toughest problems of aspirin manufacturers is to produce tablets that will disintegrate and "go to work" quickly. This is partly solved by grinding the dried mixture into the exact consistency before pressing the tablet.

Whatever YOUR grinding problem may be, BAY STATE can solve it . . . fast. Possibly the exact specifications to meet your requirements can be supplied directly from large stocks either in Westboro, branch warehouses, or from our distributors strategically located throughout the United States. *Send us your grinding problems. We can help you.*

Photograph of Aspirin Grinder, Courtesy of The Bayer Company (Sterling Drug Inc., Successor)

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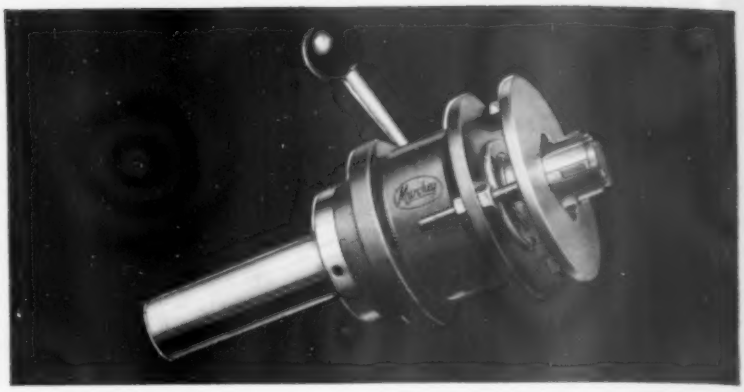
MURCHEY COLLAPSIBLE MACHINE TAPS FOR

Speed, accuracy and economy



For lowest cost per thread, use Murchey type "L" collapsible machine taps. Tap is used with handle on turret lathe and hand screw machines, and without handle on automatic screw machines and drill presses.

A simple but accurate adjustment at shank end of body expands or retracts the chasers to exact pitch diameter. This adjustment can be made without removing the tool from the machine. Chaser size adjustment at shank end facilitates adjustment and increases service life. Chasers are positively retracted.

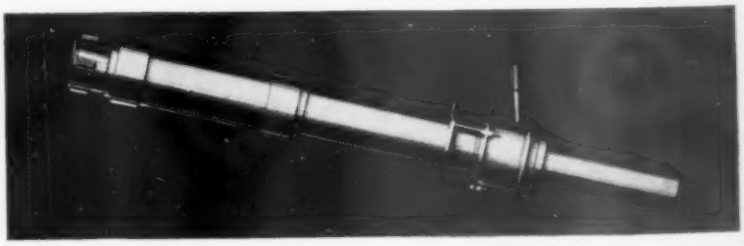
Chasers are easily replaced so that with one or more standby sets, the tool can be kept practically in continuous operation.

The type "L" tap is highly flexible. Body and nose piece are separate. Two tools with separate nose pieces provide a threading range of 15 basic sizes from 1⅛" to 6" in diameter. The nose piece is detachable so that several sizes can be used on each tool body. The sealed nose excludes chips and dirt.

● SPECIALS OF ALL TYPES

Special collapsible taps of various lengths having one or more pilots and other features such as reamers and boring tools can be provided for any special requirement.

Write for catalog



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